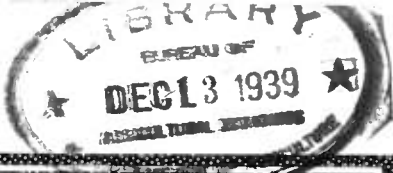


Historic, archived document

Do not assume content reflects current scientific knowledge, policies, or practices.



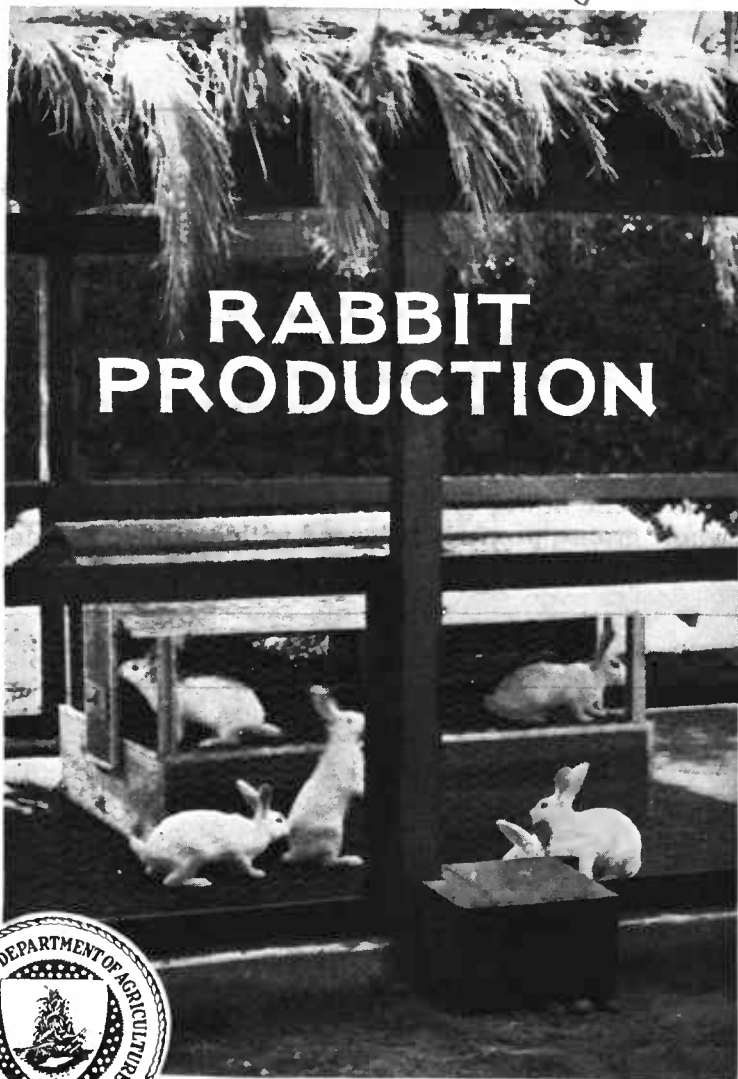
Rev
1939

U. S. DEPARTMENT OF AGRICULTURE

FARMERS' BULLETIN No. 1730

rev.
June 1939

RABBIT PRODUCTION



RABBITS ARE RAISED for food and fur in all parts of the country, but their value in supplementing the family meat supply or in adding to the farm income is appreciated in some sections more than in others. Rabbitskins are used extensively in the hat trade and in making fur garments. The pearly white meat of the rabbit is highly nutritious. No animal is better adapted for use in 4-H club work.

Improved methods of management, feeding, and breeding of rabbits are being thoroughly studied at the United States Rabbit Experiment Station, Fontana, Calif. The newer methods of selective self-feeding of whole grains, properly balanced with a protein supplement, have materially reduced the cost of production.

RABBIT PRODUCTION

By GEO. S. TEMPLETON, *Director, United States Rabbit Experiment Station,*
FRANK G. ASHBROOK, *principal biologist,* and CHAS. E. KELLOGG, *biologist,*
Division of Wildlife Research, Bureau of Biological Survey

CONTENTS

	Page		Page
Introduction.....	1	Management practices.....	15
Rabbit meat as food.....	1	Methods of handling rabbits.....	15
Rabbitskins for fur.....	2	Kindling.....	16
Rabbits for laboratory purposes.....	3	Care of the young litter.....	16
Wool production.....	3	Does that destroy young.....	17
United States Rabbit Experiment Sta- tion.....	3	Weaning the litters.....	17
Choosing a breed.....	4	Determining the sex.....	17
Selecting the foundation animals.....	5	Marking for identification.....	17
Feeds and feeding.....	6	Care of herd during critical temperatures.....	18
Nutritive ratio.....	6	Rabbit manure.....	19
Minerals and vitamins.....	6	Sanitation.....	19
Whole grains.....	6	Rabbit diseases.....	20
Protein supplements.....	7	The rabbitry and its equipment.....	20
Suggested concentrate mixtures.....	7	Hutches in general.....	20
Legume hays.....	8	All-metal hutches.....	23
Green feed and root crops.....	9	Wooden-frame wire hutches.....	27
Miscellaneous feeds.....	9	Hay mangers and feed troughs.....	30
Water.....	10	Nest boxes.....	30
Salt.....	10	Construction of self-feeders.....	30
Quantity of feed and frequency of feeding.....	10	Shelters.....	36
Breeding.....	11	Preparing products for market.....	41
Age to breed.....	11	Crating and shipping live rabbits.....	41
Making matings.....	11	Slaughtering.....	41
Test mating.....	12	Rabbit meat.....	43
Breeding schedule.....	12	Skins.....	44
Inbreeding.....	13	Tanning skins for home use.....	47
Line breeding.....	13	Salt-acid process.....	48
Cross breeding.....	13	Salt-alum process.....	49
Importance of heredity.....	13		

INTRODUCTION

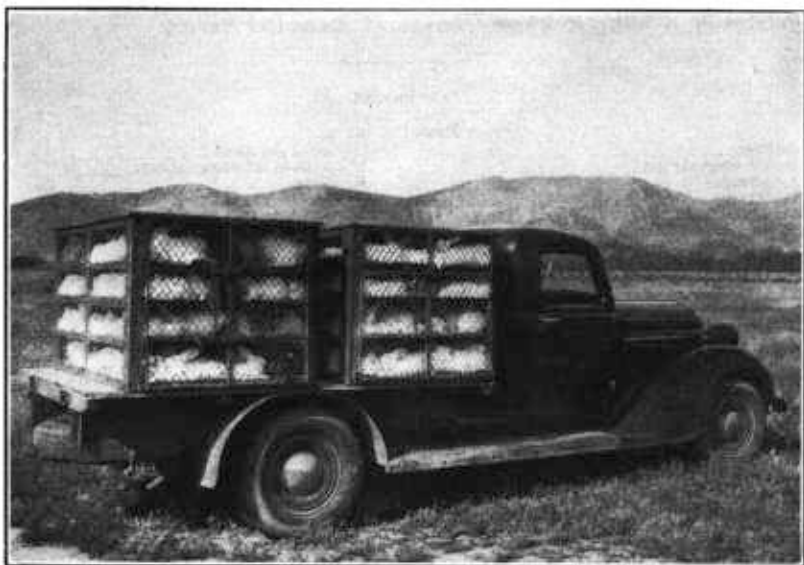
RABBIT RAISING has developed into an important industry. Rabbits are raised primarily for meat and fur, but increasing numbers are being used for biological, laboratory, and other experimental purposes. The production of rabbit wool is a recent phase of the industry, but it is still in its infancy. Rabbits are excellent animals for 4-H Club work. They also make ideal pets and will continue to be raised as a hobby.

The industry lends itself to a wide range of possibilities, from small back-yard units of 3 or 4 hutches for supplementing the family meat supply to large commercial rabbitries of 500 hutches.

RABBIT MEAT AS FOOD

In some sections of the country the consumption of domestic rabbit meat has attained considerable proportions, and trucks (fig. 1) make regular trips to rabbitries to pick up market animals and deliver them to centralized slaughterhouses. In those areas a market for domestic rabbit meat is well established; the meat is available at

butcher shops and is served regularly at restaurants and hotels. In other parts of the country there are relatively few places where the meat is displayed and regularly offered for sale. There rabbit meat is produced chiefly for home and local consumption, and the general public is not well acquainted with the product. Once constant supplies are available, however, and the good qualities are recognized, the demand should increase.



B56838

FIGURE 1.—Rabbits collected by truck for transporting to centralized slaughterhouses.

Domestic rabbit meat is pearly white, fine-grained, nutritious, and palatable and is desirable for consumption throughout the year. Fryer rabbits weighing $3\frac{1}{2}$ to 4 pounds when weaned and ready for the market at 2 months of age will yield a carcass, including liver and heart, of 50 to 55 percent of the live weight. Roasters—does and bucks that have served their period of usefulness in the herd—when properly conditioned for the market will yield a carcass of 55 to 65 percent. About 82 percent of each carcass is edible.

RABBITSKINS FOR FUR

Regardless of size and color, all rabbitskins have commercial value. They are used more extensively by the fur trade than any other kind of fur. The better grades are dressed, dyed, and sheared (although some skins are used with the long hair) and made into fur garments and trimmings for women's coats, suits, and dresses. Skins not suitable for garments are used as linings for men's and boys' gloves and in the manufacture of felt hats. Even the fine shreds into which the skins are cut in separating the fur for felt purposes are utilized in the manufacture of glue.

In the manufacture of garments, the skins of rabbits are being substituted for those of wild animals, many of which are disappearing from much of their former range. Fur dressers and dyers have mastered so well the art of imitating the more expensive furs by modern methods of plucking, shearing, and dyeing that the pelt of the rabbit, which lends itself readily to imitation processes, is being offered for sale under a variety of trade names. In many instances it is replacing such costly skins as ermine, seal, beaver, and leopard.

In rex rabbits the normal guard hairs are absent or are shorter than the underfur. Such skins need not be sheared, and if the natural colors are satisfactory, they need not be dyed. The mechanical shearing and dyeing of normal skins is producing greater uniformity than that obtained by breeding operations; consequently, the raising of rex varieties for fur is not profitable.

RABBITS FOR LABORATORY PURPOSES

The demand for rabbits for use in laboratories and for biological purposes is increasing. This offers opportunities to breeders located near hospitals and laboratories. If interested, such breeders should find out from the city and county health officials, laboratories, and hospitals in their vicinity the type, age, and size of rabbits desired.

WOOL PRODUCTION

The raising of Angora rabbits for their wool is profitable in some sections. This breed produces a wool 5 to 8 inches long within a year's time, and under the commercial practice of shearing four times a year, the wool attains a length of $2\frac{1}{2}$ to $3\frac{1}{2}$ inches each quarter. A mature animal not suckling young will shear on an average about 12 ounces a year. The greatest quantity is produced in winter. Pregnant does should not be sheared over the belly. The wool is reported to be unusually warm and light when made into garments but, owing to its cost and its fluffy nature, it is used mostly in conjunction with other fibers. The fiber is of a fine texture and takes the delicate pastel shades of dye.

In general, Angora rabbits are cared for in the same way as are other rabbits, but special precautions in feeding and management must be taken to obtain a clean fleece free from debris. No precise data are available on the kinds and quantities of feeds necessary for the maximum production of good-quality wool, but research may reveal that the feed requirements of rabbits raised for wool are distinctly different from those of rabbits raised for meat.

The raising of rabbits for wool is a new phase of the industry, and its future will depend on a satisfactory margin between cost of production and dependable market values.

UNITED STATES RABBIT EXPERIMENT STATION

The recommendations made in this bulletin are based largely on findings at the United States Rabbit Experiment Station, established and maintained at Fontana, Calif., by the Bureau of Biological Survey, in cooperation with the Fontana Farms Co. and local rabbit breeders. At this station improved methods are developed for producing rabbits with meat and fur of fine quality, for insuring sani-

tary surroundings, and for preventing outbreaks of parasitic and other diseases. Although the work is conducted in the one locality, the fundamental principles developed are applicable in any section of the country.

The equipment of the station, on the site of a 5-acre orange grove, includes an administration building containing offices and laboratories (fig. 2); various open and closed types of houses sheltering hundreds of hutches and cooled on hot days by a sprinkler system; the superintendent's residence; and storage houses, in which hay and grain are kept and prepared for feeding. A carpenter shop, a

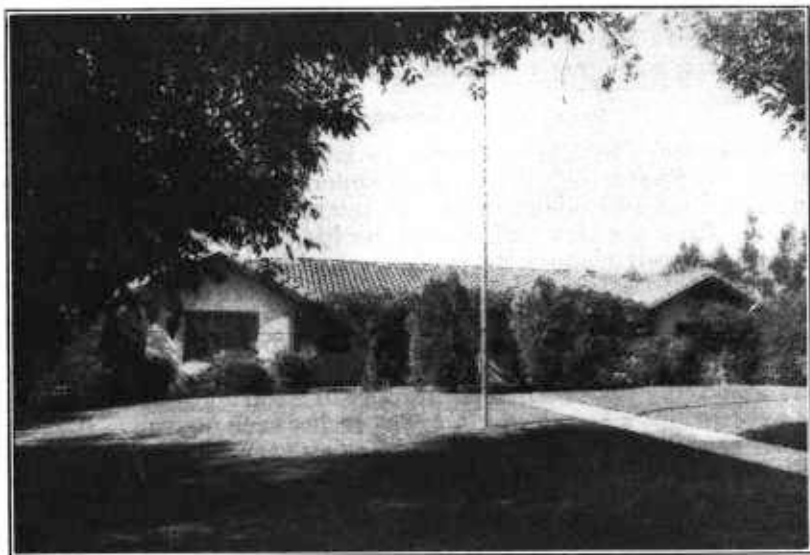


FIGURE 2.—Administration and laboratory building, United States Rabbit Experiment Station, Fontana, Calif.

garage, a small slaughterhouse, and a concrete manure pit complete the lay-out. About 1,000 to 1,200 rabbits are used at a time in the various experiments, or an aggregate number in excess of 4,000 in the course of a 12-month period. Thousands of rabbit breeders and other interested persons from different sections of the United States and from foreign countries visit the station each year. Fontana, in San Bernardino County, is 50 miles east of Los Angeles, and can be reached by the Pacific Electric Railway, the Santa Fe Railroad, and United States Highways 66 and 99.

CHOOSING A BREED

A prospective rabbit breeder should first determine in which phase of the industry he wishes to engage—whether in meat and fur, wool, laboratory animals, or fancy stock—and then select the breed best adapted to his needs. Mature animals of the smaller breeds weigh 3 to 4 pounds each, and those of the larger breeds 14 to 16 pounds. In color, also, there is a wide variation, so the breeder may select the breed that will meet his individual preference in this respect.

Although the American Rabbit and Cavy Breeders Association has set up 51 different standards for breeds and varieties of rabbits, the beginner in commercial production should make his selection from only 6 or 8 breeds. Fine distinctions will only be confusing to him, and from a utility standpoint a large number of breeds and varieties will be a handicap to the proper development of his own business and also to that of the industry. The rabbits best suited in size and conformation to the production of meat and fur are such medium and larger breeds as Flemish Giant, New Zealand, American, Beveren, French Silver, and Chinchilla. White rabbits that are satisfactory meat producers are most desirable (fig. 3) because their skins usually bring higher prices in the markets. The preference among such white breeds is largely a matter of personal choice.



B56840

FIGURE 3.—A New Zealand White doe and her healthy, vigorous, good-type litter.

SELECTING THE FOUNDATION ANIMALS

The beginner in rabbit raising may start with young rabbits just weaned or with mature animals. When young are used for foundation stock, the breeder has an opportunity to become acquainted with his animals and their habits before they reach the production stage. It is best to begin on a small scale, for example, with 1 buck and 2 to 10 does, and then expand operations as the experience of the breeder and the market for the product may justify.

When purchasing breeding stock, it is better to deal directly with reliable breeders; brokers handling live rabbits are seldom able to vouch for the conditions under which their animals were produced. Reliable breeders will always stand behind the stock they offer and will give references. National, State, and local rabbit breeders' organizations can furnish names and addresses of breeders from whom stock can be purchased, and further inquiries can be made of local chambers of commerce and better-business bureaus. It is contrary to Government policy to vouch for the integrity or the financial standing of any individual or company. The Rabbit Experiment Station is purely a research institution and does not sell breeding stock.

The essential requirements of good foundation stock are: (1) Health and vigor; (2) ability to reproduce profitably; and (3) type and conformation consistent with ability to produce marketable offspring of high quality and the desired size. Animals deficient in vitality, even though free from disease, cannot be expected to produce young profitably.

FEEDS AND FEEDING

To produce good meat and fur, rabbits must be furnished wholesome feeds that are relished. For a profitable undertaking such feeds should be available at a reasonable cost. Only good-quality, fresh feed should be used; wilted, mildewed, moldy, and dusty feeds are predisposing factors to digestive troubles. Proper feeding is important in keeping the animals healthy and lessening losses from disease.

NUTRITIVE RATIO

Economical and profitable feeding can best be obtained by balancing rations according to the three nutrients of feeds—fats, carbohydrates, and proteins. Tables showing the nutrients for various feeds are included in texts on principles of feeds and feeding. Fats and carbohydrates are fat-producing and energy-producing constituents, fats being two and one-fourth times more valuable in this respect than carbohydrates. Grains especially rich in fats and carbohydrates are oats, wheat, the grain sorghums, barley, and corn. Protein develops lean tissue, hair, and connective tissue. The legume hays and other plants in early stages of growth, soybean meal, peanut meal, sesame meal, and linseed meal (or the pea-size oil cakes or pelleted form of these meals) are rich in protein and also are palatable to rabbits.

Since feeds that are rich in protein are the most expensive, the relative proportion of this nutrient to the combination of fats and carbohydrates should receive primary consideration. This proportion for any feed, known as the nutritive ratio, is found by multiplying the percentage of digestible fats by $2\frac{1}{4}$, adding to this the percentage of digestible carbohydrates, and then dividing this sum by the percentage of digestible protein, as in the following formula:

$$\text{Nutritive ratio (N. R.)} = \frac{\text{Digestible fats (\%)} \times 2\frac{1}{4} + \text{digestible carbohydrates (\%)}}{\text{Digestible proteins (\%)}}$$

In stating nutritive ratios, protein is always expressed by 1.

MINERALS AND VITAMINS

Little definite information is available concerning the mineral and the vitamin requirements of rabbits. Unquestionably, a mineral or a vitamin deficiency is less likely to occur if the animals are supplied with a wide variety of feeds that include two or more grains, a good-quality legume hay, green feed or root crops, and salt. It is especially important that the legume hay be bright green in color and leafy and that the green feed or root crop be fresh and sound.

WHOLE GRAINS

The whole grains—oats, wheat, barley, and the grain sorghums (milo, hegari, feterita, segrain, and kafir)—are palatable and satisfactory for feeding rabbits. In feeding whole corn, considerable will be wasted, for the rabbit will eat the germ part of the seed and waste the hard portion. If the price of corn makes it desirable to use some in the ration, it should be ground into meal. Ground, rolled, or milled grains are less palatable and desirable for feeding rabbits and, when stored, they decrease in nutritive value.

PROTEIN SUPPLEMENTS

The whole grains, however, even when a good-quality legume hay also is fed, do not furnish a sufficient quantity of protein. To supply the necessary protein, soybean meal, peanut meal, sesame meal, or linseed meal, or the pea-size oil cake or pelleted form of these meals, should be included in the rations. Rations having nutritive ratios of 1:3.75 to 1:5 have proved satisfactory for dry does, herd bucks, and developing does and bucks, but nursing does and young litters require more protein, the most satisfactory nutritive ratio for these being about 1:2.75 to 1:4.50.

The pea-size oil cake, free from meal, is the most desirable form for mixing the soybean, peanut, sesame, or linseed meal with the whole grain. In localities where these oil cakes are not available, the pelleted form of the meals may be used. Mills equipped with pelleting machines can make the pellets from the meals without adding any binding material. For feeding rabbits the pellets should be three-sixteenths of an inch in diameter and one-eighth of an inch long. The meal, the pea-size cake, and the pelleted form have the same nutritive value.

SUGGESTED CONCENTRATE MIXTURES

Cereal grains are similar in nutritive value, and in the formulas herein suggested one can be substituted for another, pound for pound, without materially changing the feed value. The choice of the grains to be used in a mixture will depend largely on availability and relative cost. The selection of a protein for balancing the grains will likewise depend on the availability and cost of the meal, the pea-size cake, or the pelleted form. Soybean, peanut, and sesame in pea-size cake, pelleted, or meal form, contain about 40 percent of protein and can be used interchangeably in the mixture, pound for pound; linseed averages about 30 percent of protein and should be used in the proportion recommended in the mixtures.

CONCENTRATE MIXTURES (BY WEIGHT) FOR DRY DOES, HERD BUCKS, AND DEVELOPING DOES AND BUCKS

Mixture No. 1(Nutritive ratio 1:3.91 to 1:4.50¹)

- 2 parts whole oats.
- 1 part whole wheat.
- 1 part whole-grain sorghum or barley.
- 1 part pea-size soybean or linseed cake.
- or pelleted soybean, peanut, sesame, or linseed meal.

Mixture No. 2

(Nutritive ratio 1:3.90 to 1:4.47)

- 2 parts whole oats.
- 2 parts whole wheat.
- 1 part pea-size soybean or linseed cake.
- or pelleted soybean, peanut, sesame, or linseed meal.

Mixture No. 3

(Nutritive ratio 1:4.36 to 1:4.46)

- 2 parts whole grain-sorghum seed.
- 2 parts whole barley.
- 1 part pea-size soybean or linseed cake.
- or pelleted soybean, peanut, sesame, or linseed meal.

Mixture No. 4²

(Nutritive ratio 1:4.19 to 1:4.84)

- 1½ parts rolled oats.
- 1½ parts rolled wheat or barley.
- 1 part corn meal.
- 1 part soybean, peanut, sesame, or linseed meal.

¹ The narrower nutritive ratio in each mixture is due to using soybeans, peanuts, or sesame, which contain about 40 percent of protein; the wider nutritive ratio is due to using linseed, which contains about 30 percent of protein.

² The mixture should be dampened slightly just before it is fed, to prevent the meal from settling out and being wasted.

CONCENTRATE GRAIN MIXTURES (BY WEIGHT) FOR DOES AND LITTERS

Mixture No. 5(Nutritive ratio 1:2.98 to 1:3.62³)

- 2 parts whole oats.*
- 1 part whole wheat.
- 1 part whole-grain sorghum or barley.
- 2 parts pea-size soybean or linseed cake, or pelleted soybean, peanut, sesame, or linseed meal.

Mixture No. 6

(Nutritive ratio 1:2.96 to 1:3.59)

- 1 part whole oats.
- 1 part whole wheat.
- 1 part pea-size soybean or linseed cake, or pelleted soybean, peanut, sesame, or linseed meal.

Mixture No. 7

(Nutritive ratio 1:3.25 to 1:3.95)

- 1 part whole grain-sorghum seed.
- 1 part whole barley.
- 1 part pea-size soybean or linseed cake, or pelleted soybean, peanut, sesame, or linseed meal.

Mixture No. 8⁴

(Nutritive ratio 1:3.17 to 1:3.70)

- 1 part rolled oats.
- 1 part rolled wheat or barley.
- 1 part corn meal.
- 1½ parts soybean, peanut, sesame, or linseed meal.



B38177

FIGURE 4.—A cheap and convenient device for cutting hay into short lengths.

LEGUME HAYS

The legume hays—alfalfa, clover, sweet-clover, lespedeza, cowpea, vetch, kudzu, soybean, and peanut—are palatable and adapted to feeding rabbits. Hay for rabbits should be fine-stemmed, leafy, green in color, well-cured, and free from mildew or mold.

If hay is fed whole, a considerable quantity will be wasted because the rabbits will pull a stem out of the hay manger, eat part of it, and drop the rest. To avoid this wastage and to put the hay in a more convenient form for feeding, the general practice is to cut it into 3- or 4-inch lengths. A convenient home-made equipment for this purpose is shown in figure 4, the use

³ See footnote 1, p. 7.

⁴ See footnote 2, p. 7.

of which eliminates dust and the leaf-shattering incident to chopping the hay.

In preparing baled hays for use in large quantities, a hay knife saves considerable time and labor. The bale of hay is placed on a slatted platform (fig. 5) for convenience in cutting, and the hay is cut parallel to the baling wire. Hay-cutting equipment, both hand and power driven, is available at hardware and implement stores.

GREEN FEED AND ROOT CROPS

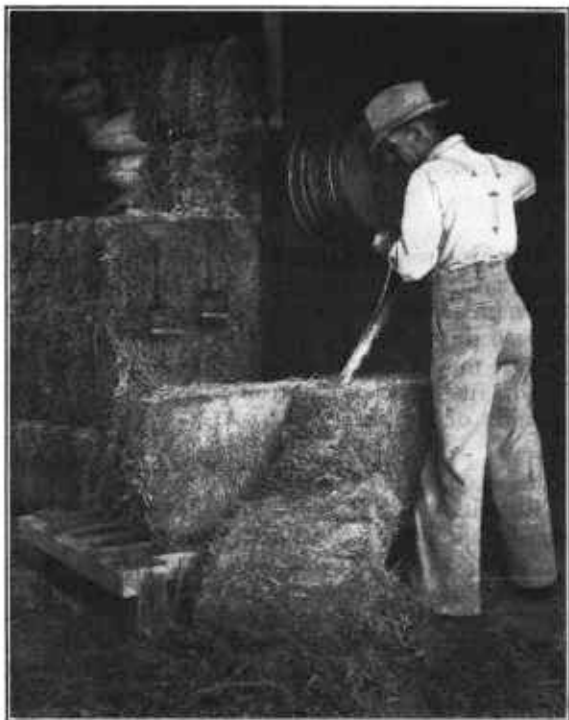
Green feeds—immature and actively growing plants—are the natural food of rabbits. These are rich in protein, minerals, and vitamins (especially vitamin A), are soft and tender, and consequently are easily digested. They should be included in the ration to maintain health and vitality. When green feed is not available, root crops may be used to supplement the grain-hay ration.

Rabbits will consume a variety of green feeds, including lawn clippings, rape, cabbage, kale, palatable weeds, waste from garden vegetables, small prunings from fruit or other trees, green cereal crops, green legume crops, and sweetpotato vines. Green feed that can be placed conveniently in a hay manger should not be thrown on the hutch floor, as it may become contaminated and unfit for consumption and be a source of reinfecting the rabbits with eggs of internal parasites. Any green feed not readily consumed should be removed from the hutch.

Root crops may be fed when fresh or may be stored for winter use. Carrots, sweetpotatoes, mangels, turnips, and beets are palatable and desirable.

MISCELLANEOUS FEEDS

Dry bread and other table and kitchen waste (except meat and greasy and sour foods) are acceptable to most rabbits, and when used as supplements to grain and roughage will add variety to the rabbit's diet. Cows' milk may be used in rations when the cost is not prohibitive, but exceptional care should be taken to prevent it from



B56841

FIGURE 5.—A hay knife saves time and labor in cutting baled hay

becoming sour or contaminated and causing digestive troubles. Dry bread mixed with milk is a satisfactory feed for does with young litters and for rabbits being conditioned for shows.

WATER

Rabbits should be supplied with plenty of fresh, pure water. In summer they require large quantities; a 10- to 12-pound doe and her 8-week-old litter of seven will drink about a gallon in 24 hours. Water should be kept available at all times. When freezing temperatures prevail in the rabbitries, the rabbits should be offered water (not too cold) at least once a day just previous to feeding. The water crocks should then be emptied to prevent freezing.

SALT

Rabbits require more salt than the quantity normally present in the grain and roughage part of their ration. Salt should be available to them at all times so that each animal can satisfy its need from day to day. Small blocks of white salt may be placed in the hutch, or salt may be incorporated in the mixed feed or pelleted part of the ration in the proportion of one-sixth of a pound of salt for each 100 pounds of concentrates.

QUANTITY OF FEED AND FREQUENCY OF FEEDING

Rabbits eat more at night than during the day. This is especially noticeable during the warm season.

Dry does, herd bucks, and developing does and bucks should be fed once a day all of one of the grain mixtures Nos. 1 to 4 (p. 7) that they will consume readily within 20 to 30 minutes. Does and nursing litters should be given all of one of the grain mixtures Nos. 5 to 8 (p. 8) that they will consume without waste each 24 hours. The quantity fed can be regulated to meet the requirements of any individual or group. If feed is left over, the quantity given at the next feeding should be reduced.

Rabbits that are being conditioned for the market may be full-fed (hand-fed or self-fed), that is, may be given all the grain mixture and roughage that they will consume. Full details for the construction of a self-feeder are given on pages 30 to 34.

When the litter is weaned, the quantity of the grain mixture fed to the dry doe should be regulated to suit her physical condition.

A good-quality legume hay should be kept before the rabbits at all times.

Green feed or root crops should be fed sparingly to rabbits that are unaccustomed to this kind of feed. To begin with, one-tenth of a pound daily to each doe or buck is sufficient, and if such material is available and economical to feed, the quantity should be gradually increased to what the rabbits will consume readily each day without waste. Green feed and root crops may contain 70 to 90 percent of water; consequently, these feeds are bulky and should be used to supplement the grain-hay part of the ration but not to replace it entirely, except for maintaining, under some conditions, mature rabbits that are not in production.

Whether a herd of rabbits should be fed one, two, or three times each day is largely a matter of personal preference and convenience. Regularity in feeding is more important than the number of feedings. When a system has been adopted, it should be adhered to. At the Rabbit Experiment Station the breeding herd is fed grain and green feed in the morning and hay in the evening. Does and litters are full-fed (hand-fed or self-fed).

The most successful breeders will study the individual animal's food requirements and not attempt to feed all in the herd alike. Some rabbits will need slightly more than the average individual, some a little less. Then, too, occasionally a rabbit will go "off feed." When this happens it is well to reduce the quantity of the ration. The offer of a tempting morsel of carrot, bread and milk, or fresh green feed may induce the rabbit to begin eating again.

BREEDING

AGE TO BREED

The proper age for the first mating of bucks and does depends on the breed and the individual development. The smaller breeds develop more rapidly and are sexually mature at a much younger age than the mediumweight or giant breeds. Does should be mated when they are coming into maturity. Some difficulty may be experienced in getting them bred if mating is too long delayed. On an average, the smaller breeds may be bred when the bucks and does are 5 to 6 months old; the mediumweight breeds at 7 months; and the giant breeds at 9 to 12 months. Some individuals within a breed will develop more rapidly than others; therefore, in determining the proper time for the first mating, maturity of the individual is more important than age.

MAKING MATINGS

Does give evidence of being ready for first mating by restlessness, nervousness, efforts to join other rabbits in nearby hutches, and rubbing the chin on the feed mangers and water crocks. This condition continues for some time, and as the rabbit does not have a regularly recurring heat period, matings may be made over a period of time, provided the does are in proper breeding condition and not diseased or in molt. Before mating, both the doe and the buck should be examined to make sure that they are free from disease.

The doe should always be taken to the buck's hutch for service. Difficulty will often be experienced if this procedure is reversed, because the doe is very likely to object to another rabbit being placed in her hutch, and may savagely attack and injure the buck. Bucks are slow also in performing service in a strange hutch. Mating should occur almost immediately on placing the doe in the buck's hutch. After the buck mounts and falls over on his side, mating is accomplished, and the doe should be returned to her own hutch.

Occasionally it may be difficult to get a doe to accept service. In such cases it will be necessary to restrain her for mating purposes. To restrain the doe, the right hand is used to hold the ears and a fold of the skin over the shoulders; the left hand is placed under the body and between the hind legs. The thumb is placed on the right

side of the vulva, the index finger on the left side, and the skin pushed gently backward. This procedure throws the tail up over the back. The weight of the body is supported by the left hand, and the rear quarters are elevated only to the normal height for service.

Bucks accustomed to being handled will not object to such assistance. It is well also to hold the doe in this way the first few times a young buck is used. This practice will expedite matings and insure ready service in difficult cases.

With a little patience and practice the breeder can so develop the technique under this system as to insure 100-percent matings. This does not mean, however, that all the does will "kindle," that is, give birth to young, but it will help materially in increasing the percentage of those that will, for a great many matings will be made that otherwise would not have been accomplished.

One buck should be maintained for each 10 breeding does. Mature, vigorous bucks may be used two or three times a week for short periods. A breeding record should be made showing date of mating and names or numbers of buck and doe.

TEST MATING

Test mating is the returning of the doe to the buck's hutch at stated intervals to determine whether she has conceived. If on being placed in the hutch the doe "growls" and avoids the buck, it is a fairly good sign that she is pregnant.

The breeder of show animals who is making matings for kindling at a definite time and the commercial breeder who is interested in keeping his does working as much of the year as possible can use the test mating system to good advantage.

All does should be test-mated when they pull fur and attempt to make nests 18 to 22 days after mating (false-pregnant does), when they prepare their nests several days in advance of the correct time for kindling and do not keep the nests clean, and when they fail to take on flesh or to show signs of pregnancy.

In view of the fact that a number of does that are bred and fail to conceive may experience false pregnancy and cannot conceive during the 17-day period, test mating on the eighteenth day after mating will be likely to detect the largest number of does that have failed to conceive. Does may also be test-mated at other times, and it may pay to test-mate a few days after mating as well as on the eighteenth day.

BREEDING SCHEDULE

The breeding schedule to be followed will be determined by the type of production. It would probably be best not to attempt to produce more than two or three litters a year in raising animals for show purposes. The time for matings should then be so arranged that the offspring will be of proper age and development for the show classification. In commercial production for meat and fur, the breeding animals should be worked, if possible, throughout the year. With the gestation period 31 or 32 days and the nursing period 8 weeks, this requires mating the does at the time the litters are weaned. If no "passes" (failures to produce young) occur, it is thus possible to produce four litters in a 12-month period. If the size of

the litter is materially reduced for any reason, the doe may be rebred earlier than called for by the regular schedule.

The condition of the individual animal should be used as the index for the proper time of mating. If, upon weaning the litter, the doe is reduced materially in physical condition, she should be allowed to rest until she has regained proper breeding condition.

INBREEDING

In response to many inquiries as to whether inbreeding is desirable, that is, whether rabbits that are closely related should be mated, the Bureau advises the average rabbit raiser not to attempt inbreeding for the following reasons:

Inbreeding knows no favorites. It will intensify poor qualities just as readily as it will good qualities.

The average breeder has not the ability to judge exceptional qualities in his breeding stock, nor does he usually have the necessary knowledge of the previous history of his animals to know what results may be expected.

Because the rabbits of the average breeder are usually of mixed inheritance, inbreeding such animals will always result in a variety of progeny.

Inbreeding is not harmful in itself, but it is sure, rapid, and effective in revealing the genetic structure of living forms. It will always remain a most potent procedure in developing and improving any breed of rabbits; in fact, no procedure other than close mating with rigid selection can be relied upon unfailingly to fix a type. Inbreeding, however, is a two-edged sword with which the ordinary rabbit raiser cannot afford to play. Discarding all undesirable forms, which is a necessary part of inbreeding, requires courage and considerable financial resources.

LINE BREEDING

Line breeding is the same in principle as inbreeding, except that the matings are made with animals that are not so closely related. Consequently, the characteristics of mated individuals, whether desirable or undesirable, are not fixed in the offspring so rapidly as they are when inbreeding is practiced. Probably most attempts by the novice at inbreeding or line breeding are made because the breeder wishes to avoid purchasing a new buck. Rather than take chances of obtaining inferior offspring by making close matings, it would be better for the novice to purchase a new buck of the desired type when it is necessary to breed does that are related to the herd buck.

CROSS BREEDING

Cross breeding is the practice of mating a purebred rabbit of one breed with a purebred rabbit of another breed. This form of breeding is adapted principally to the production of new strains and should be attempted only by breeders with considerable experience.

IMPORTANCE OF HEREDITY

A few fundamental principles of breeding evolved from years of scientific study and observation should be noted carefully. Present evidence indicates that environment has little to do directly with

improvement of animal form and that proper care and management practiced over several generations have no cumulative effect in developing a better breed of rabbits. Good feeding and care do, however, have the indirect value of providing a basis on which to select individual rabbits that because of their heredity will respond most satisfactorily to such care and management.

If improvement in rabbits is brought about, it must come chiefly through the hereditary factors transmitted through the germ cells. Effort, therefore, should be concentrated toward improvement by so mating the animals as to recombine these factors in more desirable forms.

The facts in brief are: Thousands of factors, called genes, determine the inheritance of each individual. The genes are collected in groups like beads on a string or like little packets. The groups are called chromosomes, which are of microscopic size, and the number in each cell is definite for each species. In the rabbit the number of chromosomes is 44, made up of 22 pairs. One of each pair comes from the father and the other from the mother.

The numerous breeds of rabbits, differing in size, color, and form, have resulted from various more or less stable combinations of these chromosomes. Frequent new combinations account for off-type individuals cropping out within a breed and explain also the extreme variability noticeable in the newer breeds as compared with older breeds that have eliminated most of the variable factors. The chromosomes frequently exchange genes, and this regrouping permits various recombinations, which are at once the hope and the despair of animal breeders. Without such variations there is no chance of improvement; with them there is no assurance of fixing a type without constantly selecting animals with desirable factors and discarding those with undesirable ones.

Another form of variation, known as mutation, though less common and less important from the breeder's standpoint, has produced types of some of the most important commercial varieties of rabbits. An example is the rex type, in which the guard hairs are either shorter than the underfur or entirely absent. Rex is recessive to the normal coat, and consequently a normal-haired rabbit may possibly be a carrier of rex. Any breed can be "rexed" within three generations by proper matings, if a sufficient number of rabbits are produced. When the offspring of a normal-haired rabbit and a rex-appearing animal are bred together, 25 percent of the litter will be pure rex, and if a New Zealand White and a Castorrex are mated, about 1 out of 16 of the offspring will be both white and rex.

Woolly, or long hair, is another mutation in rabbits. This, however, unlike the rex, is an undesirable trait. Woolly in rabbits is also a recessive, and consequently any rabbit that one suspects of having the woolly character can be tested by mating it with a woolly-appearing rabbit (and therefore pure for this character). If any young rabbits produced from this mating show the woolly character, one can be certain that the animal being tested is a carrier of woolly even though it appears normal-haired. Neither should be used in breeding. This particular type of woolly is different in appearance from that of the Angora rabbit.

MANAGEMENT PRACTICES

Just as in any other business, success in raising rabbits depends upon efficient management. First of all the rabbit raiser should become thoroughly acquainted with his animals—their characteristics and behavior, their likes and dislikes. Consideration for the welfare of animals is always necessary for success in raising them. Proper arrangement of equipment, hutches, and buildings is also essential to efficient management.

METHODS OF HANDLING
RABBITS

Rabbits should never be lifted by the ears or the legs. Handling in this manner may cause injury.

Fryer or small rabbits may be lifted and carried comfortably by grasping the loin region gently, yet firmly, the heel of the hand being toward the tail of the animal (fig. 6). This method prevents bruising the carcass or damaging the pelt.

Medium weight rabbits may be lifted and carried by grasping with the right hand the fold of skin over the shoulders, the back of the rabbit being toward the body of the carrier, and placing the left hand under the rump to support the weight of the animal (fig. 7).

Heavy rabbits may be carried comfortably and prevented from struggling by grasping the fold of skin over the shoulders with the right hand, and lifting and holding the rabbit against the left side of the carrier with its head under his left arm, his forearm being extended along the side of the animal with his hand under its rump to support its weight (fig. 8).

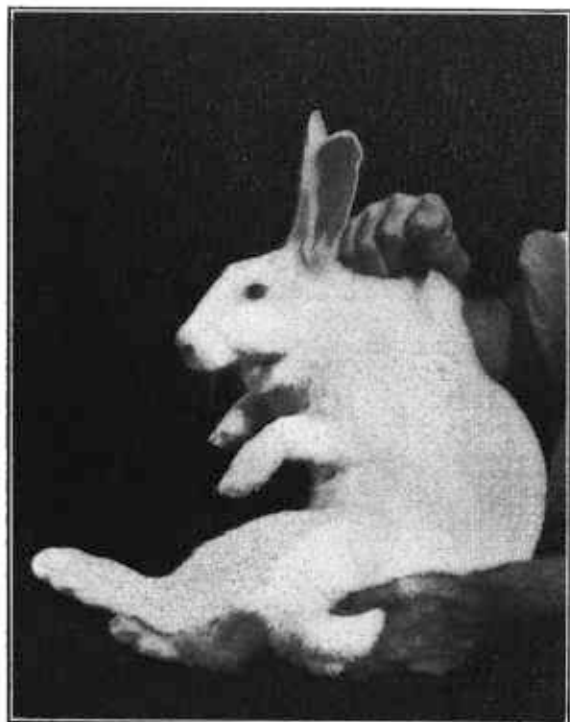


B56842

FIGURE 6.—The proper way to lift a fryer rabbit to prevent bruising the carcass or damaging the pelt.

KINDLING

A nest box with a sufficient quantity of straw to make the nest should be placed in the hutch 27 days after mating. A day or two before kindling the doe usually consumes less food than normally.



B56843

FIGURE 7.—Proper way to lift a mediumweight rabbit.

She should be undisturbed and made as comfortable as possible. Small quantities of green feed are tempting to the appetite at that time and have a beneficial effect on the digestive system. Most litters are kindled at night. After kindling, the doe may be restless and should not be disturbed until she has quieted down.

CARE OF THE YOUNG LITTER

On the day after kindling it is good practice to inspect the litter. Quietly place the hand in the nest box and remove any deformed, undersized, or dead young. If one is careful and quiet in making the inspection, the doe will generally not ob-

ject to it, and there is no danger of causing her to disown the young. If she should become nervous and irritable, place some tempting feed in the hutch immediately after the inspection to distract her attention and quiet her.

There is considerable variation in the size of litters. In the utility breeds litters usually number 7 or 8, but some may contain as many as 12 to 18. For commercial purposes 7 is the ideal number to leave with the doe. If several does are mated at about the same time, the litters can be increased or decreased in number by adjustments within 2 days after kindling. When young are no more than 2 days old, the does do not object to transfers from one litter to another. A larger number of animals can be developed more uniformly if the litters are of the desirable size.

The doe will line the nest with fur from her own body. If she should fail to pull sufficient fur to protect the litter properly, it would be well to pluck some from the region of the hip, side, and underline. The fur is easily removed at that period.

DOES THAT DESTROY YOUNG

Individual does occasionally destroy and eat their young. In most cases this abnormal appetite is due to a ration inadequate in quality or quantity; in others, to a nervous doe being disturbed following kindling. Proper feeding and and handling during pregnancy will do more than anything else to prevent this tendency. A valuable doe that destroys her first litter should be given another chance; if she continues the practice with subsequent litters she should be sold for meat.

WEANING THE LITTERS

Does that are excellent mothers will nurse their litters for 6 to 8 weeks, and the young will develop more rapidly if they are left in the hutch with their mothers until they are 8 weeks of age. By that time the milk supply will have decreased and the young become accustomed to consuming more feed; and weaning will be less of a shock than if undertaken at an earlier age.

DETERMINING THE SEX

The sexes should be separated at weaning. The sex of young rabbits can easily be determined by pressing open with the thumb and forefinger the sexual aperture just in front of the anal opening. In does, a longitudinal slit is observed; in bucks the opening is round, and the male organ can be made to protrude.

MARKING FOR IDENTIFICATION

In order to keep records it is necessary to identify each of the breeding rabbits. Tattooing the ears is satisfactory and permanent and, when properly done, will not disfigure them. Instruments for



B56844

FIGURE 8.—Proper way to carry a heavy rabbit.

the purpose may be obtained from biological and livestock supply houses. A good type is one in which separate lugs, with a series of numerals, can be inserted into a plierlike handle. Such an instrument perforates the inner surface of the ear in one operation. India ink or drawing ink is then rubbed into these small holes.

CARE OF HERD DURING CRITICAL TEMPERATURES

In almost all sections of the United States high summer temperatures necessitate some changes in the general care and management of rabbits. Adequate shade should be provided to protect the animals during the hotter part of the day, but rabbits should not be placed where they are totally excluded from sunlight during the cooler hours. Good circulation of air throughout the rabbitry is necessary, and an abundant supply of water should be available at all times.

New-born litters and does well advanced in pregnancy are most susceptible to the injurious effects of high temperatures. Heat suffering among the young is characterized by extreme restlessness; in the older animals, by rapid respiration, excessive moisture around the mouth, and occasionally slight hemorrhages around the nostrils. Rabbits that show symptoms of extreme suffering from the heat can be relieved by being removed to a quiet, well-ventilated place. They should be given a feed sack moistened with cold water to lie on. In well-ventilated rabbitries, wetting the tops of the hutches and the floors of the houses on a hot day will reduce the temperature 6° to 10° F. The tops of the hutches should be waterproof, as rabbits must be kept dry. Overhead sprinkling equipment may be used in houses with concrete or soil floors that drain readily.

During the summer, when it is difficult to regulate the quantity of fur in the nest box so the litter can be made comfortable and losses prevented, a cooling basket (fig. 9) provides comfort for the young from the time they are kindled until their eyes are open and they are able to look out for themselves. This basket should be 15 inches long, 6 inches wide, and 6 inches deep. It is inexpensive, simple in design, and easy to construct. All that is needed is a piece of $\frac{1}{8}$ -inch-mesh hardware cloth 15 inches long and 18 inches wide; two $\frac{3}{4}$ -inch boards 6 inches square; and two laths 15 inches long, $1\frac{1}{2}$ inches wide, and $\frac{3}{8}$ inch thick. Tack the hardware cloth to the sides and bottom of the two square boards. The wire cloth serves as the front, bottom, and back of the basket, while the boards form the ends. To prevent bending, nail the two laths lengthwise, in front and back of the basket, outside the wire, to the sides of the end boards. The top edges of the laths should be flush with the tops of the boards. At the back, insert two screw hooks in the end boards about 2 inches from the top so that the basket can be hung up.

When the temperature is high enough to cause the young to become restless, they should be placed in the basket; it should then be hung up inside the hutch near the top and left for the day. In the evening, when the heat has moderated, the litter is returned to the nest box. In sections where high temperatures continue throughout the night, the young must be placed in the nest box for a short time in the evening for nursing. They then should be replaced in the basket for the night and allowed to nurse again in the morning.

Mature rabbits, if kept out of drafts, suffer little from low temperatures. Young litters should be provided with warm nest boxes (see figs. 18 and 19, pp. 30 and 31), and plenty of straw should be supplied to enable the doe to build a warm nest.



B56836.

FIGURE 9.—A cooling basket hung in the hutch provides comfort for the young during hot weather.

RABBIT MANURE

The quantity of manure produced in a rabbitry depends on the age and type of the rabbits and the kind of ration fed. A 10-pound New Zealand doe and her four litters of seven each, weaned at 8 weeks of age, will, in 12 months, produce 6 to 9 cubic feet of manure free from litter, the quantity depending on the type of ration. Such rabbit manure when air-dried weighs about 16 pounds a cubic foot. This type of fertilizer is adapted for use with flowers, shrubs, lawns, gardens, and trees.

SANITATION

To protect the health of the herd, the rabbitry equipment must be kept in a sanitary condition. Manure, soiled bedding, and unused feed should be removed daily. The water crocks and feed troughs should be inspected daily. They should be washed frequently in hot, soapy water, rinsed in clear water, allowed to drain well, and then placed in the direct rays of the sun to dry. If, after washing, it is impracticable to sun the equipment properly, it should be rinsed first in water to which a disinfectant has been added and then in clear water.

The mistake of going from hutch to hutch and washing the water crocks and feed troughs with the same brush or cloth and then immediately returning them to the hutches without exposing them to direct sunlight or disinfecting and drying them should be avoided. This practice will serve only to spread disease.

To prevent or control a disease or parasitic infection, the hutches and equipment should be thoroughly disinfected with one of the coal-tar byproducts and allowed to dry before replacing the rabbits.

Nest boxes should be properly cleaned and disinfected before being used a second time.

RABBIT DISEASES

Although maintaining sanitary conditions in the rabbitry is a preventive measure for controlling disease in the herd the breeder should constantly be on the alert for the appearance of any symptom that might be an indication of disease. Suspected cases should be isolated and held in quarantine for at least 2 weeks to determine definitely whether they are dangerous to the health of the herd. Newly acquired rabbits and those returned from shows should be placed in quarantine for at least 2 weeks before being put with the breeding herd to insure that they are entirely free from parasites and diseases.

The use of hutches with the self-cleaning type of floor (figs. 13 and 17) and guards on feed troughs (figs. 15 and 17) will prevent rabbits from becoming contaminated from dirty feed and aid greatly in controlling internal parasites.

As effective treatments are known at the present time for very few of the rabbit diseases, it is usually simpler and safer to destroy a few animals that are sickly than to attempt to treat them and run the chance of their spreading infection to healthy stock. This is especially true of animals with snuffles. For further information on rabbit diseases and their treatment breeders may consult Farmers' Bulletin 1568, Rabbit Parasites and Diseases.

THE RABBITRY AND ITS EQUIPMENT

The kind of buildings needed for a rabbitry depends upon the location, the climate, and the money to be invested. Whatever the extent of the business, the producer should plan for construction and equipment that will facilitate handling the animals with the minimum of manual labor. Care in feeding, breeding, and handling the rabbits, as well as in cleaning the hutches and keeping the house sanitary, is of the utmost importance. Construction, therefore, should be as simple as possible, and ample provision should be made for light and for fresh air, but strong drafts and winds should be avoided.

In mild climates little protection is required other than a good roof, and the sides of the hutches may be constructed either wholly or in part of wire netting. Where there is much cold weather, additional protection must be provided. This may be achieved by enclosing the sides and back of each hutch with wood or by placing the hutches in a shed or other shelter. Rabbits must also be protected against extremes of heat. This may be done by placing the hutches in the shade of trees, shrubbery, or lattices. Protection against rain, too, must be furnished, for rabbits cannot stand exposure that results in the coat becoming thoroughly wet.

HUTCHES IN GENERAL

To provide individual quarters, rabbit hutches should be designed to meet the square-foot floor-space requirements of mature animals. Hutches should be 2½ feet deep, 2 feet high, and 3 feet long, inside

measurements, for the small breeds, 4 feet long for the medium-weight breeds, and 6 feet long for the giant breeds. The arrangement of the hutches in single, double, or triple tiers is a problem for the individual rabbitry. Where space is not too great a factor, single-tiered hutches are preferable, as they have the advantage of convenience in observing and caring for the rabbits. The two-tier arrangement utilizes space to good advantage and saves time in feeding and caring for the animals. Three-tiered hutches are necessary when space is limited, but are not entirely satisfactory for caring for and observing the animals in the bottom and top tiers.

Rabbits are more easily cared for and less likely to become diseased in well-built hutches than in poorly constructed, temporary ones, which become foul unless frequently cleaned and rebedded with straw, leaves, or other absorbent. Self-cleaning hutches (figs. 14 and 17) need no bedding and are easily kept in good condition.

Hutches should be so located as to avoid unusual excitement among the animals. Domestic rabbits are quiet in nature and enjoy being undisturbed, especially during the middle of the day.

Many different types of hutches have been used, but the most satisfactory are (1) the semienclosed hutch constructed with ends and back of wood and with an extending roof for protection, used in outdoor rabbitries in the colder climates (figs. 10 and 11), and the same general type of construction but with a more open front, used extensively throughout the Middle and Southern States (fig. 12); (2) the wooden-frame wire hutch, consisting of a wooden frame with front, back, and ends of wire, usually 1-inch-mesh woven poultry wire (figs. 16 and 17); and (3) the all-metal hutch (figs. 14 and 15).

If tightly built shelters are used for the rabbitry, the wooden frame and the all-metal hutches are satisfactory in cold climates, and they are particularly suitable in sheds in mild climates.

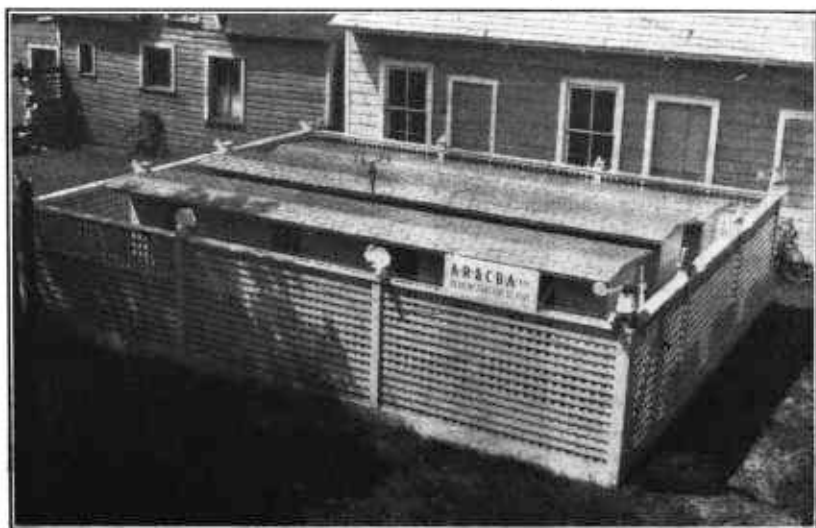
Hutch floors may be constructed of $\frac{5}{8}$ -inch-mesh galvanized hardware cloth, 19 gage; perforated galvanized metal; wooden slats varying in width from 1 to $1\frac{1}{2}$ inches and in thickness from $\frac{1}{2}$ to $\frac{3}{4}$ inch, spaced $\frac{5}{8}$ inch apart; or solid boards having a slight slope



B7766M

FIGURE 10.—Outdoor hutches for cold climates.

towards either the front or the back. The hardware cloth, perforated metal, and slat floors have the advantage that the hutch floors are self-cleaning. The perforated metal floor provides maxi-



B7767M

FIGURE 11.—Hutches in a back-yard rabbitry.



B7768M

FIGURE 12.—Outdoor hutches for the Middle and Southern States.

much comfort for the rabbits and permits effective treatment with fumigants and disinfectants but may collect moisture in a persistently foggy climate.

ALL-METAL HUTCHES

Domestic rabbits often become restless and gnaw exposed surfaces of wood or other readily destructible material within the hutch. In such cases repairs are needed more or less continuously, the hutch looks unattractive, and sometimes unsanitary conditions develop.



B56845

FIGURE 13.—All-metal hutches at the United States Rabbit Experiment Station. Feeding, watering, and cleaning are facilitated by using hutches of this type. (See also fig. 9.)

The use of metal exclusively in hutch construction seemed impracticable until recently because of the large investment required. Now, however, electro spot-welded wire fabric⁵ provides a suitable and relatively inexpensive material. Several types of rabbit hutch constructed of this fabric are manufactured and sold, and the Rabbit Experiment Station has designed all-steel hutches that can be economically constructed of stock materials by anyone with mechanical ability (fig. 13).

⁵ Called muskrat fence.

Convenient, two-compartment hutches, as illustrated in figures 14 and 15, can be made for the most part of electro spot-welded wire fabric, 1- by 2-inch mesh. In 24-inch widths this material can be used for the sides and ends. Labor can be saved by using one length of the wire fabric for all sides, bending it at the corners; but if

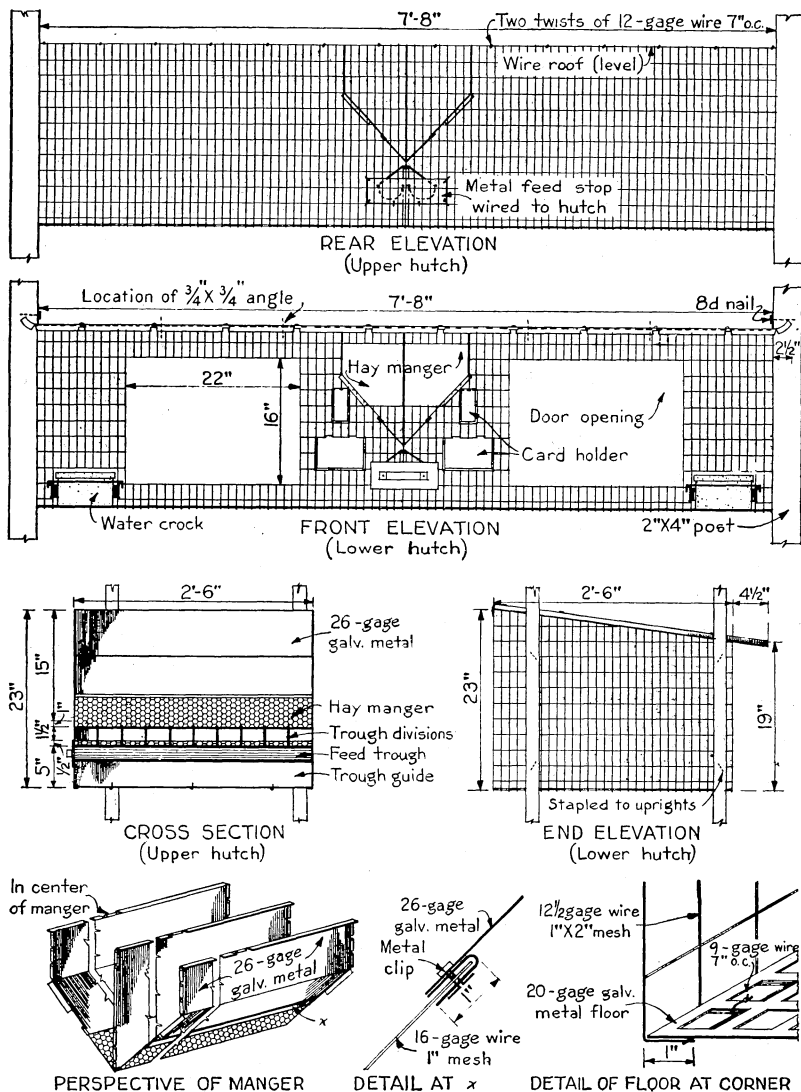
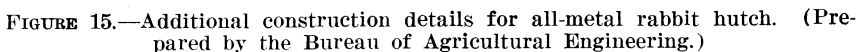


FIGURE 14.—Construction details for all-metal rabbit hutch. (Prepared by the Bureau of Agricultural Engineering.)

separate pieces are cut for front, back, and sides, these can be fastened together at the corners with spiral wire or a soft galvanized stovepipe wire of about 12 gage. In the same way the sides and ends after assembling can be attached to a bottom of either galvanized 5/8-inch-mesh hardware cloth or perforated metal sheets

[illegible]

structed of 1-inch-mesh, 16-gage poultry netting, as shown in figure 14. The electro spot-welded wire fabric can be cut as desired to provide openings for doors and feed trough and permit access to the hay manger. Methods of constructing a wire lock or fastener, hinges, and partitions beneath the hay manger are shown in figure 15.

BILL OF MATERIALS FOR ALL-METAL HUTCH

As shown in figures 14 and 15, two all-metal hutches (one upper and one lower) can be constructed of the following materials:

Wire fabric.—All wire fabric should be electro spot-welded, 12½-gage, 2-inch vertical mesh, and 1-inch horizontal mesh. The following quantities are required:

- 48 linear feet, 24 inches wide—for walls and four doors.
- 8 linear feet, 30 inches wide—for top of upper hutch.

Galvanized sheet steel.—Wherever practicable the edges of the galvanized sheet steel used should be turned under ¼ inch for stiffness. The following quantities are required:

- 1 sheet, 26 gage, 4 by 8 feet, cut into the following pieces:
 - 4 pieces, 15 inches by 2 feet 8 inches—for sides of hay manger.
 - 2 pieces, 16 inches by 2 feet 8 inches—for center of hay manger.
 - 4 pieces, 1½ by 18 inches—for crock straps.
 - 4 pieces, 2 inches by 2 feet 6 inches—for manger mesh guard.
 - 4 pieces, 7 by 5 inches—for breeding-record cards.
 - 4 pieces, 3 by 5 inches—for feed-record cards.
 - 2 pieces, 6 inches by 2 feet 6 inches—for feed-trough division.
 - 2 pieces, 12 inches by 2 feet 6 inches—for trough guides.
- 1 sheet, 24 gage, 3 by 3 feet, cut into the following pieces:
 - 2 pieces, 4 by 9 inches—for front of feed trough.
 - 2 pieces, 1½ by 10½ inches—for feed-trough handles.
 - 2 pieces, 1 foot 3 inches by 2 feet 7 inches—for feed trough.
- 1 sheet, 26 gage, 3 by 8 feet—for roof. (Not cut into pieces.)
- 4 angles, 20-gage galvanized iron, ¾-inch sides, 31 inches long.

Double each leg. For roof support of lower hutch at spaced intervals. Cut away enough of one side at both ends for the other side of angle to rest on sides of hutch. Riveting angle in place to under side of roof gives added rigidity.

Galvanized sheet steel should be used for the floors of the hutches and should be perforated with ⅝-inch square holes seven-eighths of an inch on centers both ways. The following quantity is required:

- 2 sheets, 20 gage, 2 feet 6 inches wide by 7 feet 8 inches long.

Wire will be needed as follows:

- 5 linear feet, 12-gage galvanized soft wire—for lacing.
- 7 linear feet, 9-gage copper wire—for lacing.
- 2 linear feet, 8-gage copper wire—for lacing.
- 4 pieces, 13 inches long, No. 9 soft galvanized wire—for crock hooks.

Miscellaneous.—The following additional materials will be needed:

- 1 piece, 1-inch-mesh, 16-gage poultry netting 30 by 12 inches—for manger.
- 2 pieces of strap iron, ¼ by ¾ inch by 2 feet 6 inches—for feed-trough division.
- 18 pieces, ¼-inch-diameter iron rods, 10 inches long—for feed-trough division.
- 6 round-head wood screws, ⅜ by 1 inch—for feed-trough division.
- 16 large carpet tacks—for trough guide.
- 53 brass clips or cotter pins, ⅜ by ⅝ inch, with flat heads (see detail x fig. 14).
- 4 common eightpenny wire nails.
- 16 staples, ¾ inch, 9 gage—for fastening to support.
- 2 pieces, wood boards (yellow pine or other kind), ¾ by 1½ inches by 2 feet 6 inches—for feed-trough division.
- 2 pieces, wood boards (yellow pine or other kind), ¾ by 5 inches by 2 feet 6 inches—for trough guide.
- 4 earthenware crocks, 7 inches in diameter, 4 inches deep.

WOODEN-FRAME WIRE HUTCHES

Though not so durable as the all-metal hutch, the wooden hutch with woven-wire sides and ends permits good circulation of air and is more sanitary than a solid hutch. It can be constructed, as shown in figures 16 and 17, of the following materials:

BILL OF MATERIALS FOR WOODEN-FRAME WIRE HUTCH

Lumber (all sizes net for S4S material):

- 2 pieces, $1\frac{3}{4}$ by $1\frac{3}{4}$ by 29 inches—for front corner posts. (If legs are desired the pieces should be 59 inches long.)
- 2 pieces, $\frac{3}{4}$ by $2\frac{3}{4}$ by 29 inches—for door jambs.
- 2 pieces, $\frac{3}{4}$ by 2 by 29 inches—for manger front.
- 2 pieces, $\frac{3}{4}$ by 0 by 2 by 7 inches—for triangular manger front.
- 1 piece, $\frac{3}{4}$ by $5\frac{3}{4}$ by $7\frac{1}{2}$ inches—for manger front.
- 1 piece, $\frac{3}{4}$ by $2\frac{3}{4}$ by $7\frac{1}{2}$ inches—for manger front.
- 2 pieces, $1\frac{3}{4}$ by $1\frac{3}{4}$ by 21 inches—for rear corner posts. (If legs are desired, the pieces should be 51 inches long.)
- 1 piece, $\frac{3}{4}$ by $5\frac{3}{4}$ by 21 inches—for manger rear.
- 1 piece, $\frac{3}{4}$ by $2\frac{3}{4}$ inches by 7 feet 8 inches—for top front.
- 1 piece, $\frac{3}{4}$ by $5\frac{3}{4}$ inches by 7 feet 8 inches—for top rear.
- 3 pieces, $\frac{3}{4}$ by $3\frac{3}{4}$ inches by 7 feet 8 inches—for bottom.
- 2 pieces, $\frac{3}{4}$ by $1\frac{3}{4}$ by $9\frac{3}{4}$ by 34 inches—for top ends.
- 2 pieces, $\frac{3}{4}$ by $3\frac{3}{4}$ by 34 inches—for bottom ends.
- 2 pieces, $\frac{3}{4}$ by $2\frac{3}{4}$ by 17 inches—for crock supports.
- 2 pieces, $\frac{3}{4}$ by $4\frac{1}{4}$ by $11\frac{1}{4}$ by $31\frac{3}{4}$ inches—for manger top.
- 1 piece, $\frac{3}{4}$ by $1\frac{3}{4}$ by $32\frac{1}{2}$ inches—for manger bottom.
- 1 piece, $\frac{3}{4}$ by $4\frac{3}{4}$ by $32\frac{1}{2}$ inches—for feed-trough track.
- 4 pieces, $\frac{3}{4}$ by $1\frac{1}{2}$ by 25 inches—for vertical doors.
- 4 pieces, $\frac{3}{4}$ by $1\frac{1}{2}$ by 20 inches—for horizontal doors.
- 2 pieces, 1 by $1\frac{1}{2}$ by 4 inches—for door-latch blocks.

Galvanized Iron:

- 2 pieces, 24 gage, $1\frac{3}{4}$ by 30 inches—for feed-trough guards.
- 2 pieces, 26 gage, 36 inches by 8 feet—for roof.

Miscellaneous:

- 1 piece, $\frac{5}{8}$ -inch-mesh, 17-gage galvanized hardware cloth, 30 inches by 8 feet—for floor.
- 1 piece, $\frac{3}{4}$ -inch-mesh, 16-gage poultry netting, 24 by 36 inches—for manger.
- 1 piece, 1-inch-mesh, 18-gage poultry netting, 24 inches by 8 feet—for front and doors.
- 1 piece, 1-inch-mesh, 18-gage poultry netting, 18 inches by 14 feet—for back and ends.
- 4 hinges.
- 2 door latches.
- Fourpenny box nails—for front, rear, and roof.
- Eightpenny box nails—for posts, ends, and bottom.
- Poultry-netting staples.

These hutches are designed to fit between 2- by 4-inch supports set flatwise and 8 feet apart from center to center. See figure 16 for general plan of rabbit shelter giving dimensions. If 4- by 4-inch posts are used, as indicated in figure 22, the hutches must be made 2 inches shorter or the post spacing 2 inches longer.

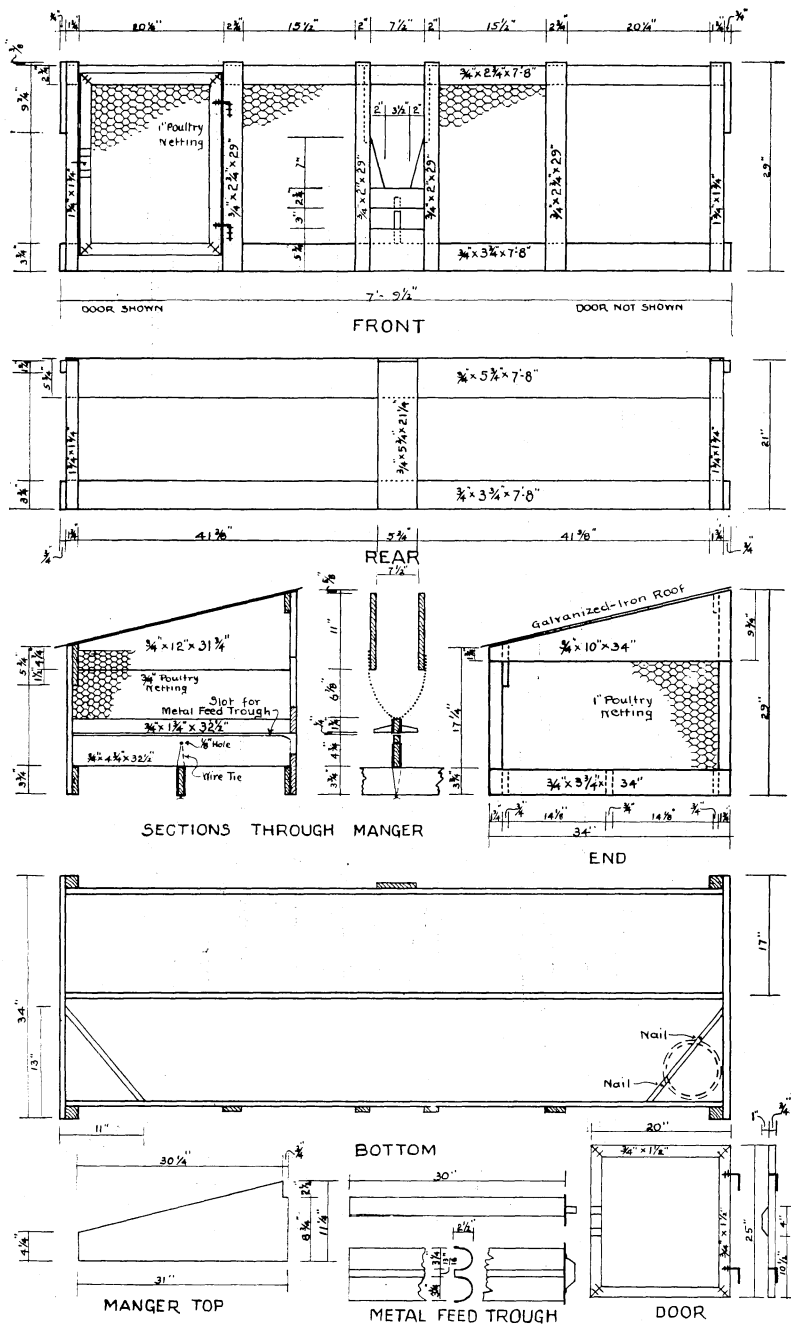


FIGURE 16.—Construction details for a two-unit wooden-frame wire hatch.

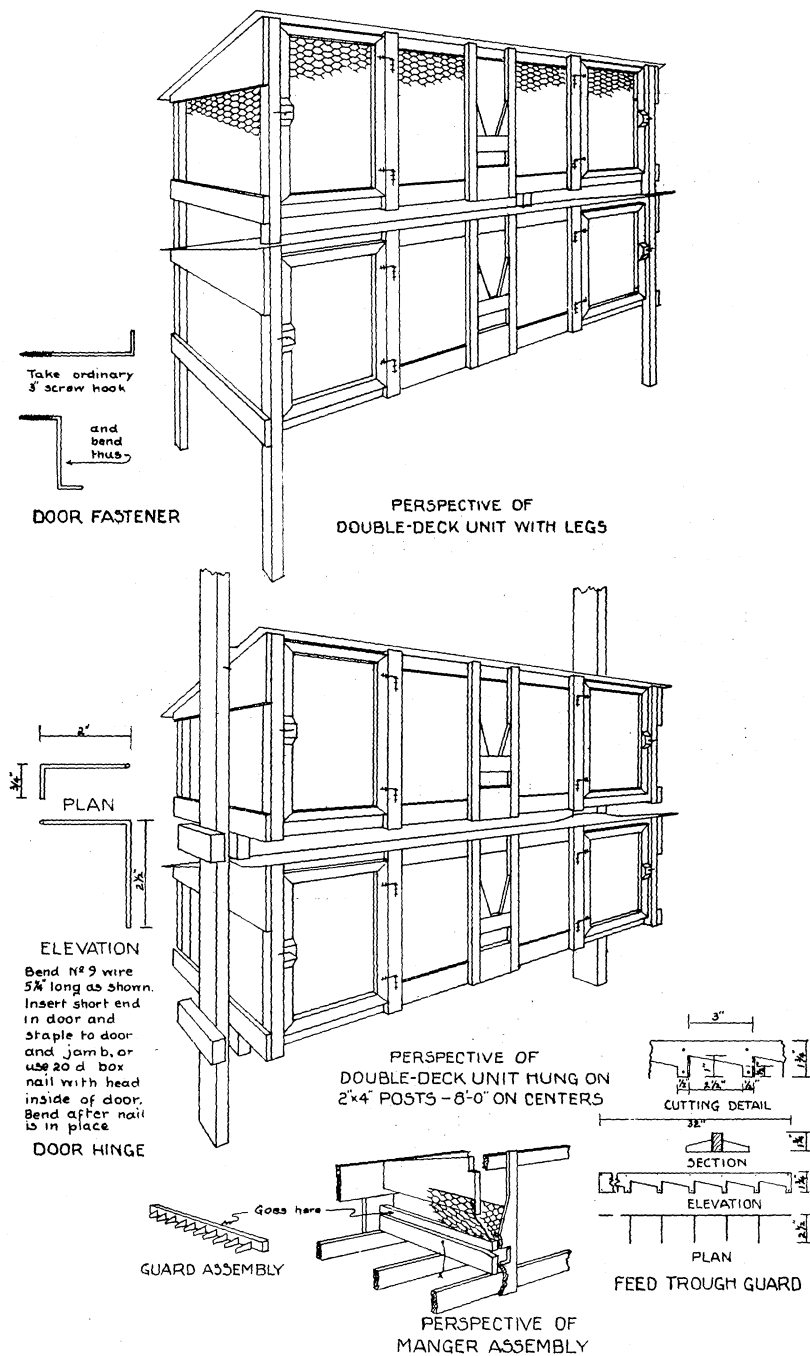


FIGURE 17.—Additional construction details for a two-unit wooden-frame wire hutch, including manner of hanging two tiers of hutches.

HAY MANGERS AND FEED TROUGHS

Hay mangers and feed troughs are an important part of the hutch equipment. They should have a capacity large enough to prevent waste of feed and save time in feeding operations. A convenient type of hay manger with a trough that prevents waste of hay is shown in figures 14 and 17. Feed troughs (see figs. 15 and 16) should be constructed of galvanized iron and should be removable, so as to be readily cleaned and disinfected. Feed guards should be placed on feed troughs at 3-inch intervals to prevent young rabbits from gaining access to the trough and contaminating the feed with their feet. Feed guards also aid materially in preventing the rabbits from scratching out and wasting the feed.

NEST BOXES

Nest boxes should be large enough to prevent crowding but small enough to keep the occupants warm by their own body heat. Two

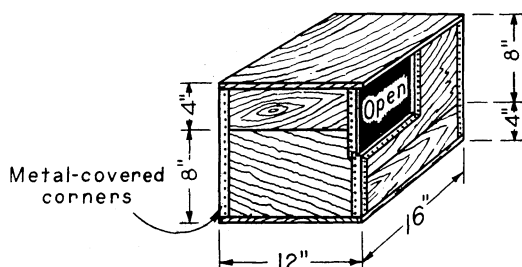
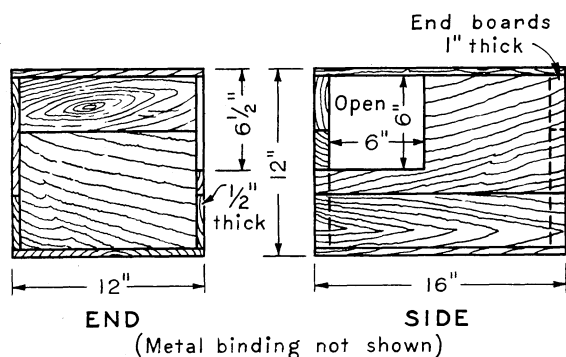


FIGURE 18.—Construction details for nest box.

CONSTRUCTION OF SELF-FEEDERS

The self-feeder is simple in design and can be constructed by any tinsmith. Figures 20, 21, and 22 present information concerning materials required, method of construction, and manner of attaching to the hutches. The one herein designed has such capacity that when filled about twice a week it will furnish a doe and her litter with all the concentrates required. None of the compartments should ever be allowed to become empty.

general kinds of boxes are used extensively—the box type (fig. 18) and the nail-keg nest box (fig. 19).

The box type is constructed so the top and bottom can be removed to facilitate cleaning. The nail-keg nest box is inexpensive and easy to construct. A nail keg with metal end hoops is best for the purpose. One with a head diameter of 13 inches is preferable for does weighing more than 12 pounds; a diameter of 11½ inches for those weighing 8 to 12 pounds; and a diameter of 10 inches for those weighing less than 8 pounds.

It is important that in constructing the self-feeder the angles of the sides and the size of the throat be as indicated in the drawings; otherwise, the feed may move too freely and be wasted, or the hoppers may become choked and the feed fail to be available.

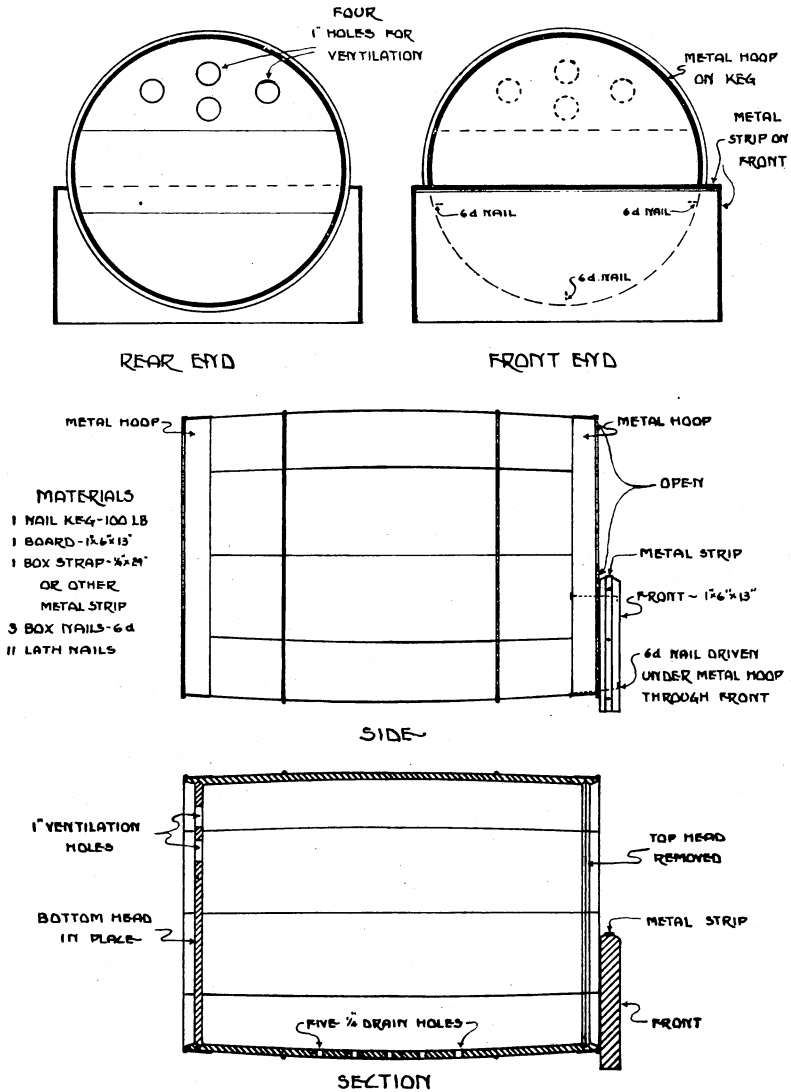


FIGURE 19.—Nail-keg nest box.

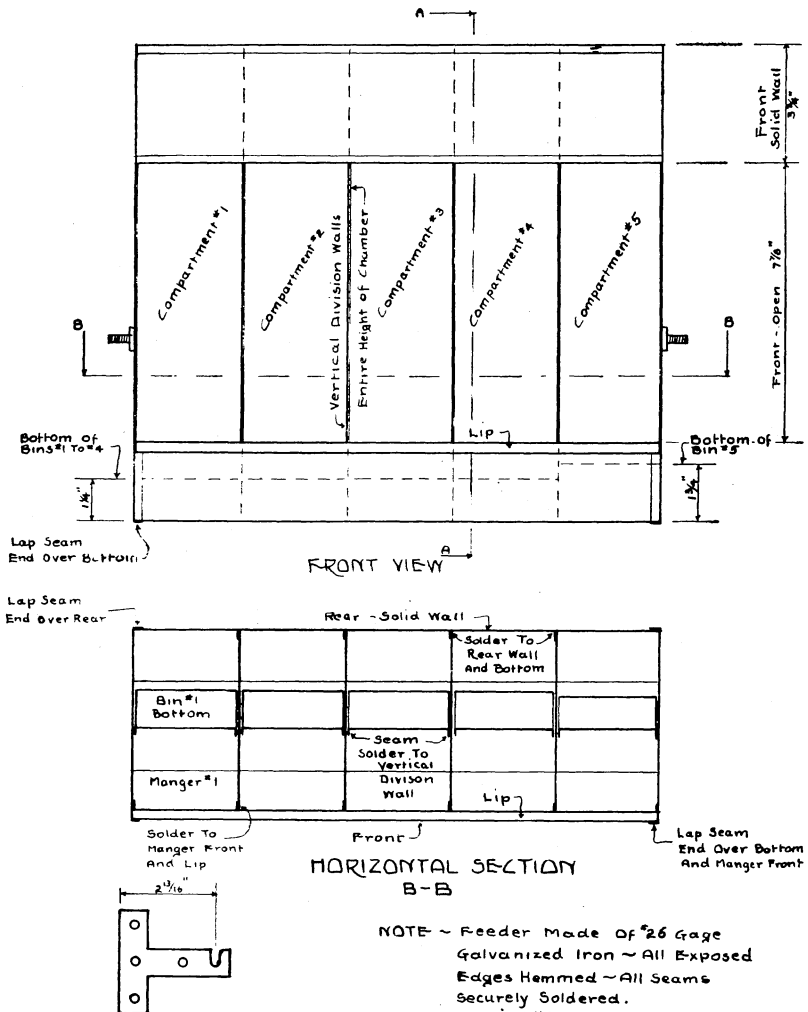


FIGURE 21.—Rabbit self-feeder. Front and horizontal views.

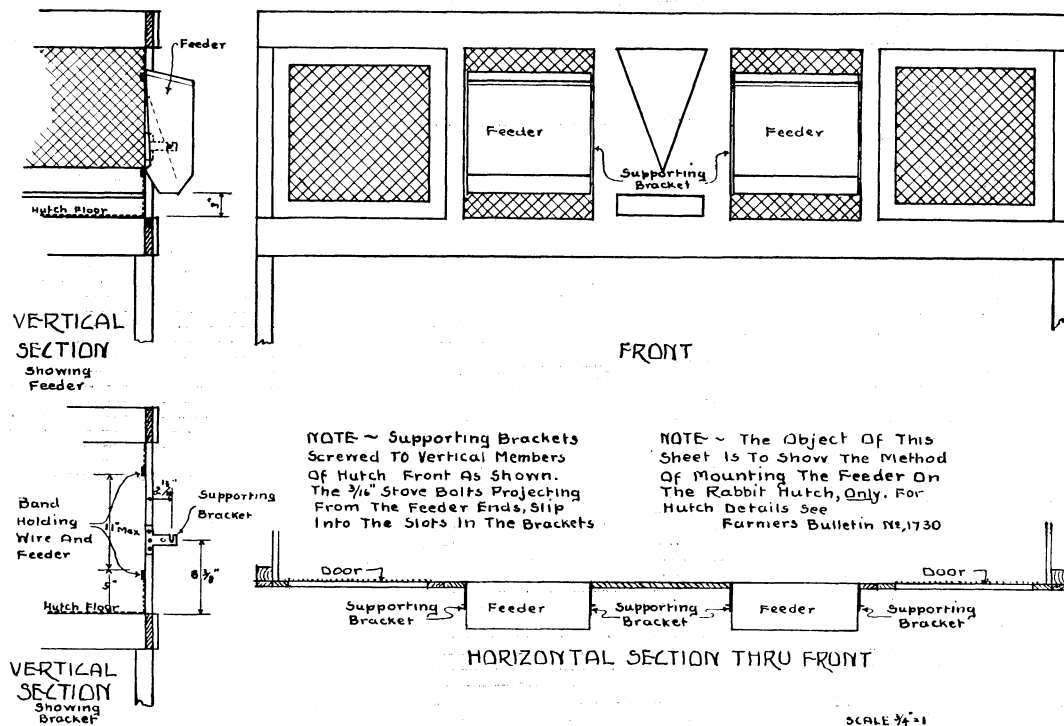


FIGURE 22.—Rabbit self-feeder. Details of installation.

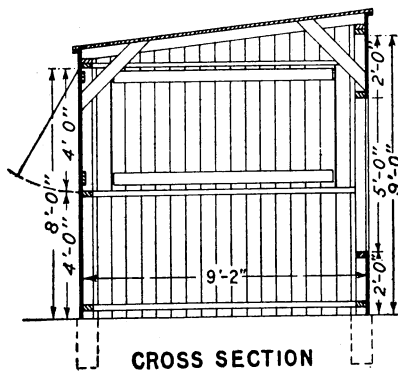
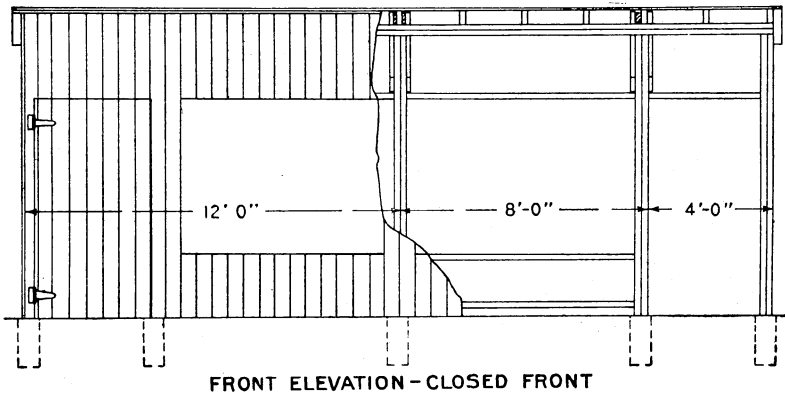
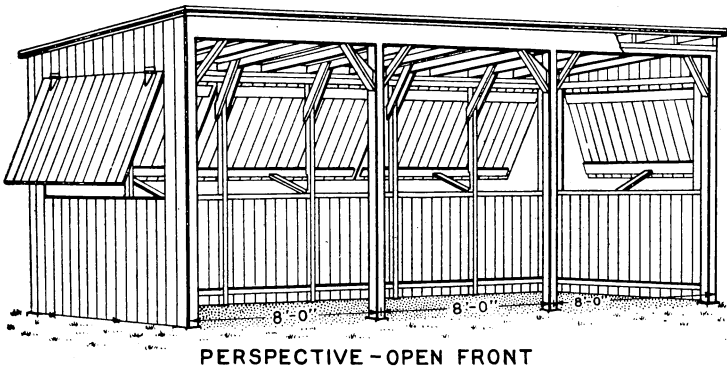


FIGURE 23.—Construction details for rabbit house.

SHELTERS

Rabbit shelters, or houses, accommodating 50 to 100 breeding animals are preferable to larger ones, for in smaller groups rabbits are less likely to contract disease, and outbreaks are more readily controlled when the animals are kept in smaller units.

BILL OF MATERIALS FOR RABBIT HOUSE

The rabbit house shown in figure 23 can be constructed of the following materials:

- ½ cubic yard of concrete—for post footings.
- 8 posts, 2 by 4 inches by 9 feet.
- 9 posts, 2 by 4 inches by 8 feet.
- 18 plates and girts, 2 by 4 inches by 8 feet.
- 6 end girts, 2 by 4 inches by 10 feet.
- 13 rafters, 2 by 4 inches by 10 feet.
- 14 braces, 1 by 6 inches by 3 feet.
- 60 pieces, 1 by 6 inches by 8 feet tongue-and-groove sheathing—for rear.
- 40 pieces, 1 by 6 inches by 9 feet tongue-and-groove sheathing—for ends.
- 2 rear facias, 1 by 8 inches by 12 feet.
- 280 feet board measure roof sheathing.
- 70 linear feet 1- by 1-inch material—for under edge of roof.
- 260 square feet of prepared roofing.
- 6 pairs 6-inch T hinges.

For open-front shelter add the following:

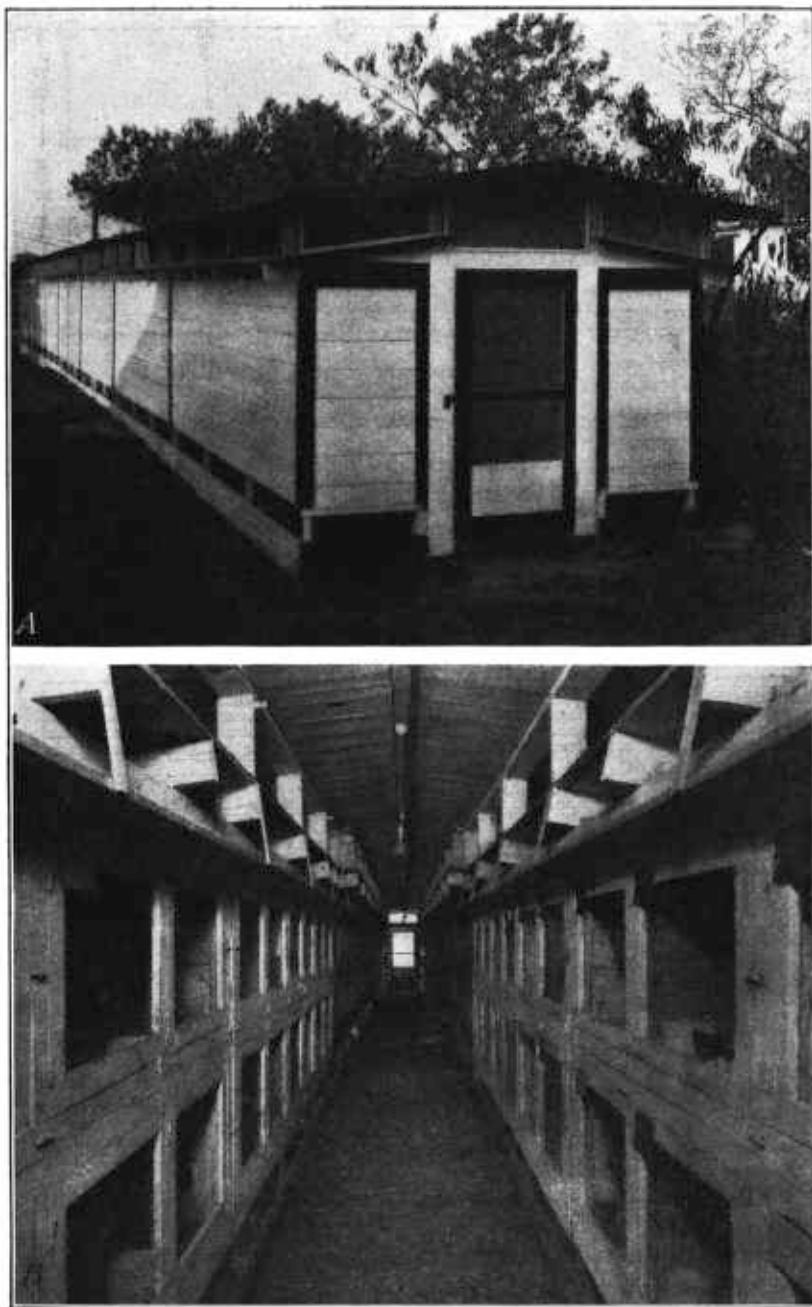
- 6 braces 2 by 4 inches by 3 feet.
- 2 facias, 1 by 8 inches by 12 feet.
- 14 post casings, 1 by 4 inches by 9 feet.

For closed shelter add the following:

- 2 posts, 2 by 4 inches by 9 feet.
- 7 girts, 2 by 4 inches by 8 feet.
- 20 pieces, 1 by 6 inches by 10 feet tongue-and-groove sheathing.
- 32 pieces, 1 by 6 inches by 5 feet tongue-and-groove sheathing.
- 6 braces, 1 by 6 inches by 3 feet.
- 2 pairs 6-inch T hinges.

A rabbit shelter adapted to climatic conditions of the Central States is shown in figure 24.

The rabbit shelter for which construction details are shown in figures 25 and 26 (see also fig. 16) has the distinct advantage that additional sections can be added as needed. A concrete floor can be provided with gutters so situated that it can be readily washed clean. Where a corrugated-metal roof makes the shelter too hot, composition shingles or rolled roofing may be laid over solid sheathing, the 2-by 4-inch rafters in such cases being placed at 2-foot intervals, center to center, to support the sheathing. Enclosing three sides or making other adaptations for climatic conditions may also be necessary. Materials needed for the shelter are listed on page 40.



B7769M; B7770M

FIGURE 24.—Rabbit shelter adapted to climatic conditions of the Central States, with double roof to provide insulation against heat: A, Outside view; B, inside view.

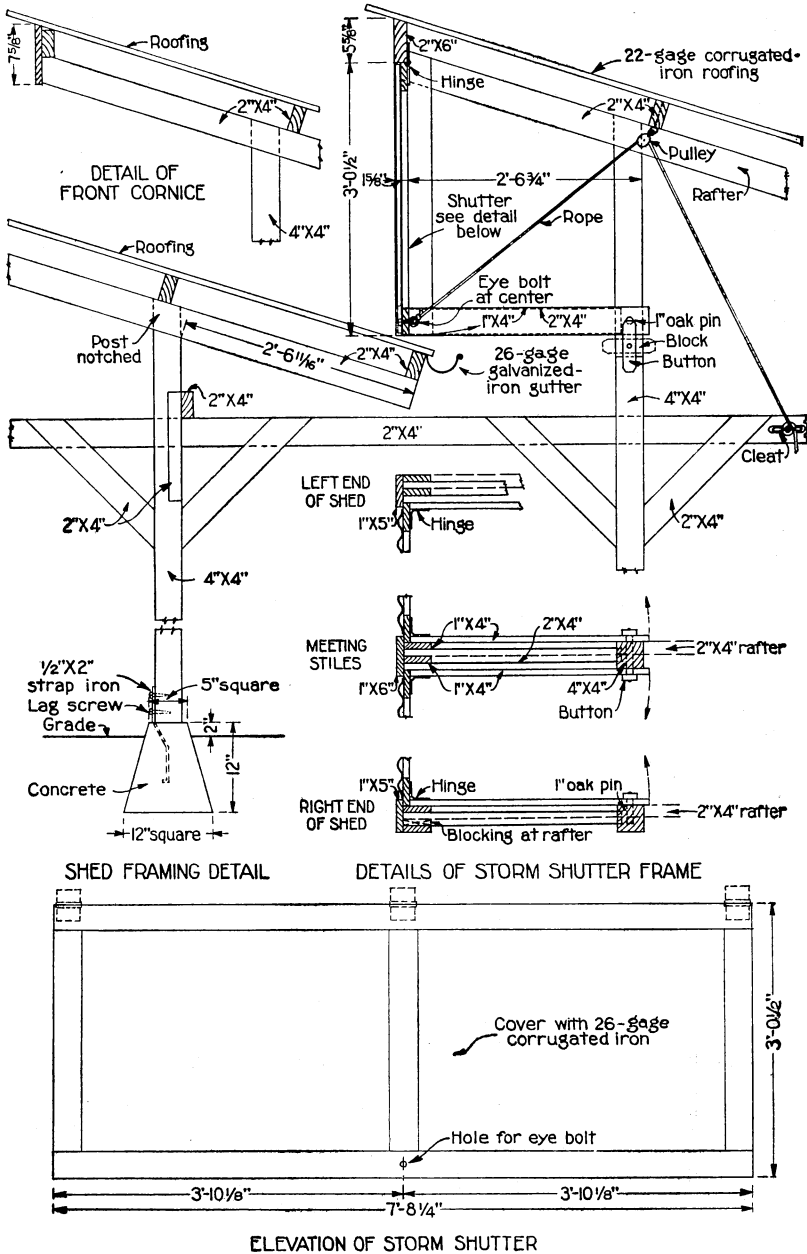


FIGURE 26.—Additional details for rabbit-hutch shelter. (Prepared by the Bureau of Agricultural Engineering.)

BILL OF MATERIALS FOR RABBIT-HUTCH SHELTER

The following materials will be needed for the rabbit-hutch shelter shown in figures 25 and 26:

- 5 sacks of cement, three-eighths of a cubic yard of sand, and three-fourths of a cubic yard of gravel for 0.8 cubic yards of concrete for post footings. (Use 1 part portland cement to 2 parts of sand and 4 parts of gravel. In localities where frost action is a consideration the footings should be placed below the frost line and be 8 by 8 inches in cross section. If the footings are 8 by 8 inches by 2 feet 8 inches the following materials will be needed: 10 sacks of cement, three-fourths of a cubic yard of sand, and $1\frac{1}{2}$ cubic yards of gravel. Precast footings cost less than those cast in place.)
- 36 strap irons, $\frac{1}{4}$ by $1\frac{1}{2}$ by 16 inches, one end drilled for two $\frac{3}{8}$ -inch lag screws.
- 72 lag screws, $\frac{3}{8}$ by 4 inches.
- 18 posts, 4 by 4 inches by 10 feet.
- 18 posts, 4 by 4 inches by 8 feet.
- 3 cross ties, 2 by 4 inches by 14 feet.
- 12 cross ties, 2 by 4 inches by 12 feet.
- 7 longitudinal ties, 2 by 4 inches by 16 feet.
- 1 longitudinal tie, 2 by 4 inches by 8 feet.
- 90 knee braces, 2 by 4 inches by 2 feet.
- 18 purlins, 2 by 4 inches by 12 feet.
- 26 rafters, 2 by 4 inches by 16 feet.
- 13 rafters, 2 by 4 inches by 8 feet.
- 5 facias, 2 by 6 inches by 16 feet.
- 2 facias, 1 by 8 inches by 16 feet.
- 1 facia, 1 by 8 inches by 8 feet.
- 8 facias, 1 by 5 inches by 3 feet.
- 4 facias, 1 by 6 inches by 3 feet.
- 12 struts, 2 by 4 inches by 2 feet, 6 inches.
- 20 hangers, 1 by 4 inches by 2 feet, 9 inches.
- 24 hangers, 1 by 4 inches by 3 feet, 3 inches.
- 7 blocks, 1 by 4 inches by 12 feet.
- 30 pieces, 1 by 5 inches by 8 feet—for shelter frame.
- 12 oak pins (1 inch), 7 inches long.
- 1 piece, 1 by 2 inches by 10 feet—for buttons.
- 50 hinges, 3 by 3 inches, with screws.
- 20 round-head screws $2\frac{1}{2}$ inches long with washers—for holding buttons.
- 10 eyebolts, $\frac{3}{8}$ by $1\frac{1}{2}$ inches, 1-inch eye and nut.
- 10 screw eyes (1-inch eye) or heavy staple.
- 10 swivel pulleys for $\frac{1}{4}$ -inch rope.
- 10 cleats (4 inches) for $\frac{1}{4}$ -inch rope, with screws.
- 90 linear feet $\frac{1}{4}$ -inch sash cord.
- 120 linear feet 4-inch gutter with hangers.
- 38 linear feet 3-inch downspout.
- 6 turn-outs for 3-inch downspout.
- 12 bends (90°) for 3-inch downspout. (All gutters and spouts to be of 26-gage galvanized metal.)
- 40 pieces corrugated roofing 3 feet long, 26 inches wide—for shutters. (Plain galvanized metal, weather-resistant wall board, or $\frac{3}{8}$ -inch tongue-and-groove ceiling could be used in place of corrugated metal.)
- 66 pieces corrugated roofing, 7 feet long, 26 inches wide.
- 66 pieces corrugated roofing, 6 feet long, 26 inches wide. (Roofing to be 24-gage, $2\frac{1}{2}$ -inch corrugations, and heavily galvanized; nails for securing roofing should be rust-resistant, providing security against leaks.)
- 18 pounds sixteenpenny common nails.
- 2 pounds eightpenny common nails.
- 1 pound eightpenny finishing nails.
- 5 pounds tenpenny common nails.
- 10 gallons of paint for woodwork (three coats).

PREPARING PRODUCTS FOR MARKET

CRATING AND SHIPPING LIVE RABBITS

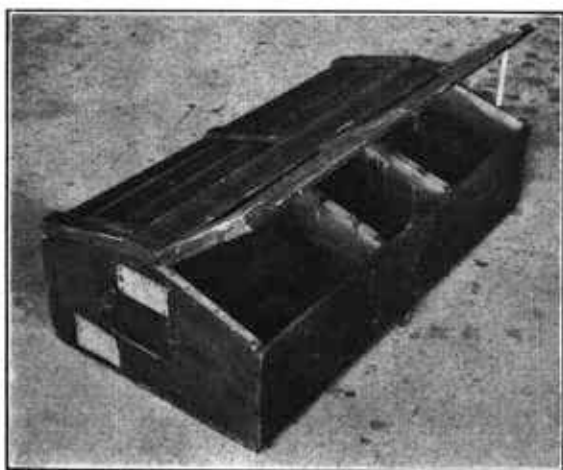
Rabbits in good condition, properly crated and provided with food and water, can be shipped almost any distance with safety, but it is best not to ship them in extremely hot or cold weather. Crates should always be comfortable, well ventilated, and furnished with bedding of straw or leaves, not sawdust. Only one animal should be placed in one compartment of a shipping crate. Animals to be in transit for 24 hours or less need no more attention than that required to supply a small quantity of feed and water at the beginning of the journey, but if the trip is long and the shipment large, greater supplies of feed and water will, of course, be needed, and it may be necessary to send along a caretaker. Plenty of fresh water and hay should be accessible to the rabbits at all times. The same kinds of feed that they have been accustomed to eating in the rabbitry should be given them in transit.

Although shipping crates can be made from packing boxes, it is not only good business but effective advertising to ship the rabbits in durable crates that are neatly built, light in weight, and attractive (fig. 27). The shipper should furnish ample space in each compartment and see to it that wire netting effectively prevents the rabbits from gnawing the wood.

When rabbits are shipped by express, a bag of food and a printed request to feed and water the animals once daily should be attached to each crate. Advice should be given against exposing the animals to sun or rain and also against placing the crates near steam pipes. The purchaser should be notified when the rabbits were shipped.

SLAUGHTERING

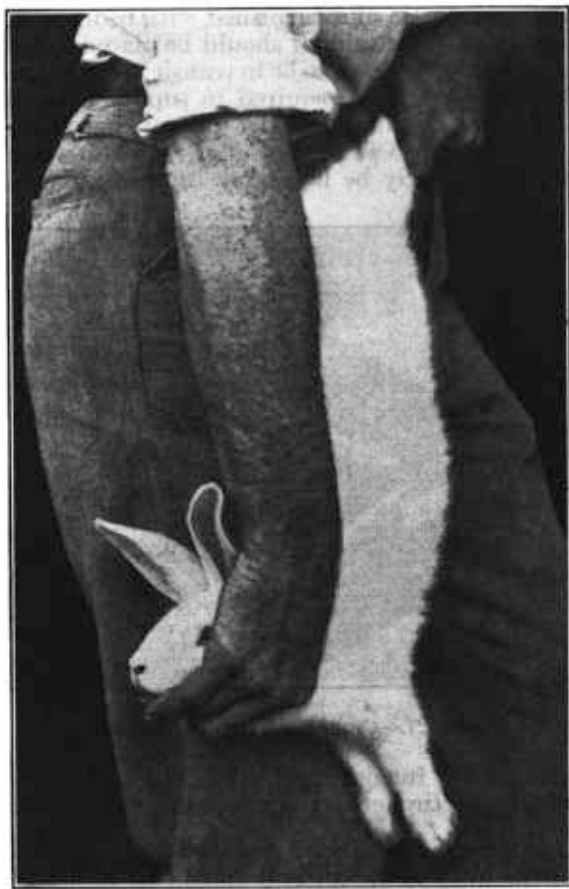
In slaughtering a rabbit, the neck is usually dislocated by holding the animal by its hind legs with the left hand and placing the thumb of the right hand on the neck just back of the ears, with the four fingers extended under the chin (fig. 28). Pushing down on the neck with the right hand, stretching the animal, pressing down with the thumb, and raising its head by a quick movement dislocates the neck, renders the animal unconscious, and prevents struggling.



B75831

FIGURE 27.—Crate for shipping live rabbits.

The carcass is then suspended on a hook inserted between the tendon and the bone of the right hind leg just above the hock. The head is removed immediately to permit thorough bleeding so the meat will have a good color. The tail is removed; the free rear leg is removed at the hock joint, and the front feet are cut off; the skin



B56846

FIGURE 28.—Method of holding rabbit for dislocating neck in slaughtering.

is then cut just below the hock of the suspended leg and opened on the inside of the leg to the root of the tail and the incision continued to the hock of the left leg. The edges of the skin are carefully separated from the carcass, particular effort being made to leave all fat on the carcass as the skin is pulled down over the animal. This not only makes a more attractive meat product but facilitates drying the skin and prevents "fat burns" on the pelt in drying (fig. 29). When a skin is left entire it is known as a cased skin. Even small cuts lessen the value of the skin. As soon as the skin is removed, it should be placed on a stretcher, secured, and hung up for drying.

After the carcass has been skinned, a slit is made along the

median line of the belly, and the entrails are removed, the liver being left in place. The right hind foot is removed by severing the leg at the hock. Particular care should be taken in dressing rabbits not to get hairs on the carcass; they are difficult to remove and give it an unattractive appearance. Rinsing the carcass in cold water facilitates removal of hair and blood and also cleanses the carcass. It is not a good practice to leave the carcass in water more than 15 minutes; prolonged soaking causes it to absorb water, and the resulting presence of water in the meat is considered an adulteration of the product.

RABBIT MEAT

Domestic rabbit meat should not be offered for sale in the same manner as wild rabbit. A neatly dressed rabbit, skinned, with the head and feet removed, is much more attractive in the meat market and impresses the prospective purchaser as likely to be more palatable than a rabbit partly dressed with fur on. The heart, liver, and kidneys, especially the liver, are palatable and should not be considered as waste, for they add to the nutritional value of the product as a whole. It would be to the advantage of rabbit breeders to insist that, when offered for sale by butchers, rabbit carcasses, whether fryers or roasters, be neatly arranged on trays in the refrigerated display cases. Sprigs of parsley around the carcasses will make the display more attractive.

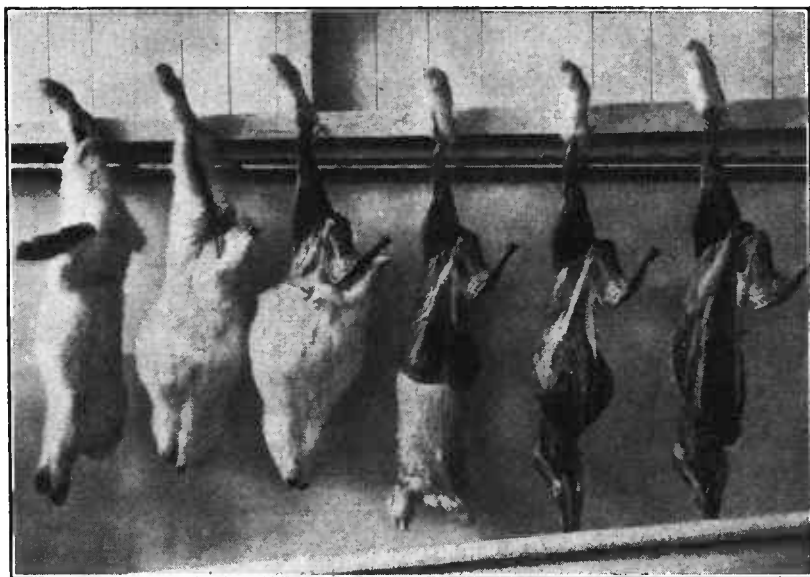
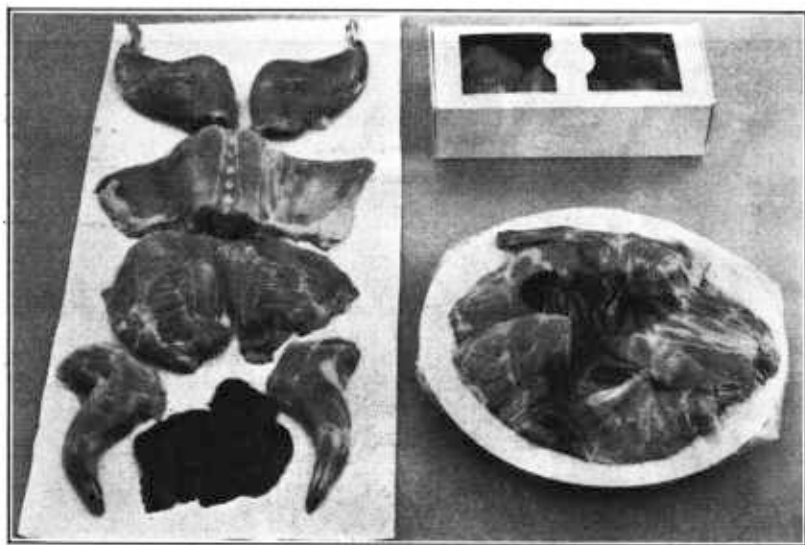


FIGURE 29.—Steps in slaughtering rabbits. (Note the flowing water on the back panel.)

The fryer rabbit will present an attractive appearance in the market if the carcass is cut up, ready for the frying pan, into seven pieces and the liver (fig. 30). A neat, sanitary package for the carcass is a paraffined box with a cellophane window. A box 9 inches long, 4 inches wide, and $2\frac{1}{2}$ inches deep is the correct size for a fryer carcass weighing $1\frac{3}{4}$ to $2\frac{1}{4}$ pounds. If the cuts in the carton are properly arranged so that the loin, thighs, and liver are exposed to view and a small piece of parsley placed in the package to add color, it will appeal to the eye of the purchaser (fig. 30). For the breeder who retails his rabbit carcasses to the home trade or furnishes butchers with meat that is to be consumed locally, a neat, sanitary, and inexpensive package can be made by arranging the pieces of the cut-up fryer on a paper plate. A piece of clear cellophane should then be placed over the carcass and secured to the plate by a string (fig. 30).

SKINS

There is a demand for good rabbit pelts supplied in large quantities; but raw-fur buyers do not as a rule purchase pelts in small lots, as the expense of handling them is almost as much as for a large number. Some buyers will accept a few hundred pelts at one time, but the majority prefer to purchase in quantities of 25,000 to 100,000. This has made it difficult for most American breeders, who keep only a limited number of animals, to market their skins to advantage. They have consequently been obliged to sell in small quantities at almost any price offered, or to hold skins until the necessary large shipments can be accumulated, a practice that is usually inconvenient or impracticable because of lack of proper facilities.



B56848

FIGURE 30.—Method of cutting up fryer rabbit and suitable containers for the carcass.

The possibility of developing a large, steady market for pelts depends much on the rabbit breeders' ability to furnish the types of rabbitskins required by the fur trade and to organize central collecting agencies that can accumulate pelts and sell them in large quantities. Scattered over widely separated areas, and in most instances unfamiliar with the demands of the fur trade, rabbit breeders have made little effort to sort and grade their skins or to combine their shipments so as to offer larger quantities at one time and thus realize better returns. The profits in some cases have gone to buyers or middlemen who purchase skins from the breeders at low prices and sell them in larger quantities at much higher prices.

Enormous quantities of rabbitskins are used annually by the fur trade, largely because the processes of plucking, shearing, and dyeing have been so perfected that good imitations of the more expensive skins can be produced. Another reason for the enormous consumption is the fact that rabbitskins are available as a byproduct of an-

other and more profitable industry—production of rabbit meat. Even in the skins of domestic rabbits there is a great variation in density and quality, depending upon the degree that the various breeders give to these points in their selective matings.

Fur manufacturers use only prime, full-furred skins; poorer grades are used by hat-felt makers. Other things being equal, white, red, and blue skins, in the order named, are in greatest demand. White skins find the most ready market with the fur trade because they can be used in their natural color or dyed any desired shade. For this reason white domestic rabbits have become increasingly popular even where meat production is the primary aim.

Some rabbitskins are used in their natural colors, but this use is restricted because the breeder cannot so readily control his production as can the dyer. Even apparently well matched raw skins become poorly matched after being dressed, and a large quantity of natural-colored skins must be available to permit proper blending. Red and blue skins can be dyed many of the fashionable shades or used in their natural state undyed; but grays, browns, spotted silvers, and most others are mixed together and dyed black or some dark color. The bleaching process has been so perfected that rabbitskins of any color can now be bleached almost white at little cost and then dyed the more delicate shades. Large skins grown on the more mature rabbits during the colder months are the most suitable for the fur trade.

Skins from domestic rabbits raised in the United States are used at the present time in the felt-hat trade because more money is made with commercial rabbits by selling them just as soon as they have attained a marketable weight. At this age the skin is small, the leather lacks strength, and the fur appears flat, mats, and does not have the good wearing qualities of fur from older rabbits. The majority of domestic rabbitskins taken from animals up to 6 months of age have a mottled appearance which is due to the contrast between the old fur that has been only partly shed, and patches of ingrowing new fur. The new fur grows at a different angle from the skin, and the fiber has a different structure. If when stroking a live rabbit from the tail towards the head, an intermixture of long and short hairs is noted, and if the fur flows unevenly under the hand, the skin is unprime.

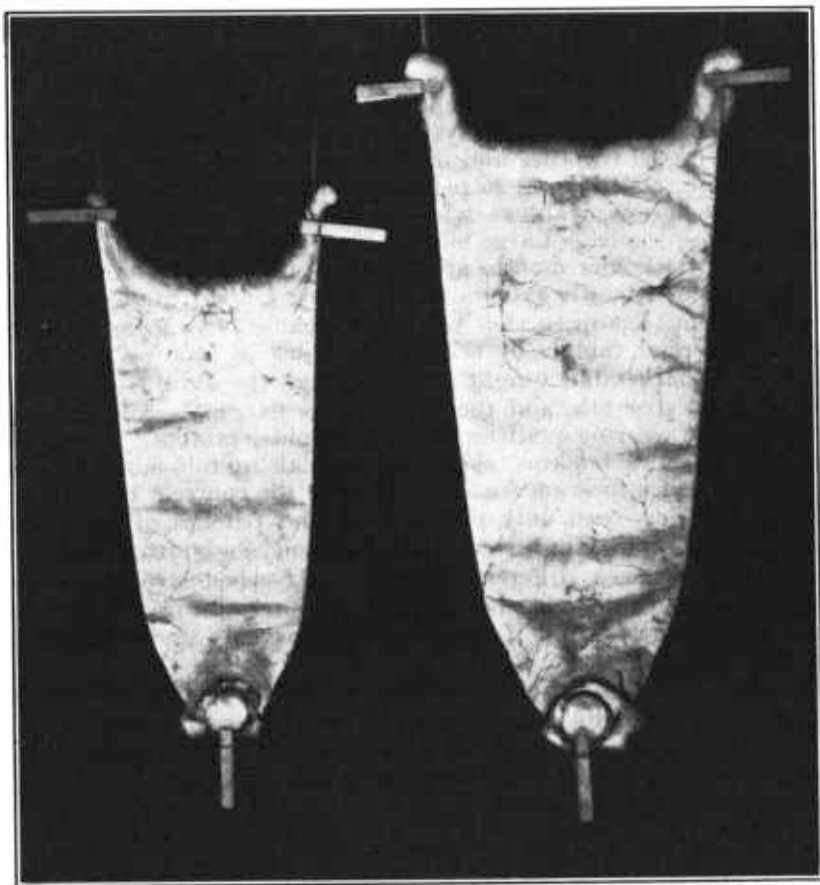
Breeders should give more consideration to the density and quality of fur on their rabbits even though the fur at present is used largely by the hat trade. Better skins will command higher prices. Improved methods of dressing may make the fryer rabbitskin more readily usable in fur garments.

CURING

While still warm, skins to be cured should be placed flesh side out, the fore part over the narrow end of wire or board formers or shapers, care being taken to remove all wrinkles. Satisfactory skin shapers can be made from No. 9 galvanized wire 5 feet long. This equipment has been called a "stretcher," but the term may give an erroneous impression; it is not desirable to stretch the skins unduly, as this tends to weaken certain parts and also opens the fur. Skins should be so arranged on the shaper as to have the four legs on one side (fig.

31) and thus avoid any possible injury to the back fur, which is the most valuable. On the day after skinning, the pelts should be examined to see that the edges are drying flat and that the skin on the front legs is straightened out.

Rabbitskins should not be dried in the sun or by artificial heat, and they should be hung in such way as to have the benefit of free circulation of air. All skins must be thoroughly dry before being packed. If they are not to be shipped for some time after being dried they should be hung in loose bundles of 50 in a cool dry place away from rats and mice. If they are kept any length of time in a warm climate or during the summer they should be sprinkled with naphtha flakes. Salt should never be used in curing rabbitskins.



B56849

FIGURE 31.—Proper way to place a rabbit pelt on a shaper, or stretcher, with all the legs on the same side.

PACKING AND SHIPPING

To avoid spoilage or damage in transit, great care should be taken in packing skins for shipment. The fur should always be left inside, and so far as possible the skins should be kept in the same shape as

when removed from the stretcher. Each one should be examined carefully to make sure that it is properly dried. A moist pelt or one that has patches of oily fat on it should not be packed or shipped.

Pelts that have been examined and are ready for shipment should be laid out flat, one overlapping the other, and made up into bales. Every two or three layers of skins, as they are being packed together, should be sprinkled with flaked naphthalene or paradichlorobenzene to keep out insects that might damage them in transit. When a bale has been finished it should be wrapped in paper and covered with burlap, sewed with strong cord or binder twine, and properly marked. Skins should always be well protected in this manner before being shipped.

SORTING AND GRADING

If the best prices are to be obtained, rabbitskins must be carefully sorted and graded for quality, color, and size. No mixed shipments should be offered, for if good and poor skins of different sizes and colors are mixed, the entire shipment is usually accepted at the price of the poor skins.

Raw-fur buyers usually grade rabbitskins as firsts, seconds, and thirds. Firsts and seconds are also divided into five classes, based on color: White, red, blue, chinchilla, and mixed. Some furriers also grade firsts and seconds as large, medium, and small. The white, red, blue, and chinchilla skins should each be packed and shipped separately, whereas skins of all other colors may be put together.

Firsts are prime pelts of large size, well-shaped, and properly stretched and dried, having all the hair and underfur intact, and the skin side free from fat, flesh, dark spots, streaks, and cuts. The thicker and denser the underfur on a pelt, the more valuable it is and the better price it will bring.

Seconds are pelts that have shorter hair and less underfur than firsts, and, except in white pelts, the skin usually shows dark spots or streaks, and sometimes large black splotches. The skin of a white pelt is white, even though the fur is poor. Seconds also include pelts that are improperly stretched and dried, that have rubbed in shipment, or that show the poor spots where the skin has been pierced or the hair is short or missing.

Thirds are pelts with short hair and thin underfur and those from animals taken too young or while shedding. Pelts that are badly cut or otherwise mutilated and poorly stretched and dried also are classed as thirds. Thirds are of no value to the furrier and are used exclusively in the manufacture of felt for hats.

TANNING SKINS FOR HOME USE

Rabbitskins to be sold should not be tanned before shipment; fur buyers prefer to purchase them in the raw state. If intended for home use, however, they may be tanned by the methods herein described, but it should not be expected that they will compare favorably in appearance and pliability with the product of a tannery or factory operated by experienced workmen and equipped with modern machinery.

In tanning, the first step is to get the skin thoroughly softened, clean, and free from flesh and grease. If cased, or whole, the skin

should be split down the middle of the belly and then soaked in several changes of clean, cool water. When it becomes soft, it should be laid over a pole or board and work begun over the skin side with a coarse file or dull knife, breaking up and removing the adhering tissue, flesh, and fat, and at the same time working the grease and oil out of the skin. It is useless to start tanning until all the tissue, fat, and grease have been removed and the skin has been made uniformly soft and pliable.

The thickness and condition of the pelt determine the length of time a skin must be soaked, some skins requiring 2 or 3 hours and others longer. A skin should be soaked until it is soft, but it should not remain wet longer than necessary, as the hair may start to slip. When the skin has been thus treated and is somewhat softened, it should be worked in lukewarm water containing 1 ounce of soda or borax to the gallon. Soap added to the water is also helpful in cutting the grease and softening and cleansing the skin. After the skin has been rinsed thoroughly in lukewarm water, the water should be squeezed out, but the pelt should not be wrung. Finally, the skin should be worked in gasoline, which should remove the last particles of dirt and grease. It is then ready for tanning.

There are several methods of tanning rabbitskins. For a comprehensive treatment of tanning, the reader should consult *Farmers' Bulletin 1334, Home Tanning of Leather and Small Fur Skins*. Directions for using two of the more successful methods, known as the salt-acid and the salt-alum processes, are here given.

SALT-ACID PROCESS

The salt-acid formula calls for a solution made up of 1 pound of common salt and one-half ounce of concentrated sulfuric acid to each gallon of water. Dissolve the salt in the water and carefully pour in the acid while stirring. This tanning liquor should be made and used in glass or earthen jars or wooden vessels, never in metal containers of any kind. When pouring in the acid, do not inhale the fumes given off. Be careful also not to get any of the strong acid on the skin or clothing. As soon as the salt-acid solution has cooled, it is ready for use.

Put the cleaned, softened skin in the solution so that it is entirely covered. After 1 to 3 days, during which it has been stirred frequently, remove it and rinse in clean, cool water. The skin should then be worked for about 10 minutes in a solution of 1 ounce of borax to 1 gallon of water. Rinse again in clean water and squeeze (but do not wring) as dry as possible. Work the skin a few minutes in the hands by rubbing and pulling, then tack it out flat, flesh side up, and apply a thin coating of grease or oil and let it dry. Fresh butter, neatsfoot oil, or olive oil are good for this purpose.

When the pelt is nearly dry but still damp, begin to work it with the hands, stretching it in all directions and working the flesh side over the edge of a board and pulling it back and forth as if shining shoes with a cloth. If the skin is rough, it may be smoothed by working it over a sandpaper block, which also helps to make it soft and pliable. Much of the success in producing a soft, pliable skin depends upon this repeated working, which must be done while the skin is drying out and not after it is dry.

If the skin is not soft enough when dry, it should be dampened and worked again as before. If still greasy, it may be given a hasty bath in gasoline. A final cleaning, accomplished by working the skin in warm, dry, hardwood sawdust, is beneficial and will add to the luster of the fur.

SALT-ALUM PROCESS

The salt-alum formula calls for 1 pound of ammonia alum (ammonium aluminum sulfate) or potash alum (potassium aluminum sulfate) dissolved in 1 gallon of water; and 4 ounces of washing soda (crystallized sodium carbonate) and 8 ounces of common salt dissolved together in one-half gallon of water. Pour the soda-salt solution slowly into the alum solution while stirring vigorously. Mix the combined solution, as used, with sufficient flour to make a thin paste, first mixing the flour with a little water to prevent lumps.

The skin, cleaned and softened as previously described, should be tacked out smoothly, flesh side up, on a board and then coated about an eighth of an inch thick with the tanning paste and protected with paper or sacking laid so that it does not come in close contact with the paste. The next day scrape off most of the paste and give another coating. At intervals of a day repeat this application two or three times, depending upon the thickness of the skin. Only thick skins from mature bucks will need as many as three applications. Leave the last coating on for 3 or 4 days. Finally scrape off the paste and work the skin in borax water, and rinse, squeeze, and then stretch and work it over a board in the manner described for the salt-acid process.

The salt-alum process is widely used and is considered slightly better than the salt-acid tannage, although alum-tanned skins often come out stiff and hard and require much working to make them soft and pliable.

ORGANIZATION OF THE UNITED STATES DEPARTMENT OF AGRICULTURE WHEN THIS PUBLICATION WAS LAST PRINTED

<i>Secretary of Agriculture</i>	HENRY A. WALLACE.
<i>Under Secretary</i>	M. L. WILSON.
<i>Assistant Secretary</i>	HARRY L. BROWN.
<i>Coordinator of Land Use Planning and Director of Information.</i>	M. S. EISENHOWER.
<i>Director of Extension Work</i>	C. W. WARBURTON.
<i>Director of Finance</i>	W. A. JUMP.
<i>Director of Personnel</i>	ROY F. HENDRICKSON.
<i>Director of Research</i>	JAMES T. JARDINE.
<i>Solicitor</i>	MASTIN G. WHITE.
<i>Agricultural Adjustment Administration</i>	H. R. TOLLEY, <i>Administrator</i> .
<i>Bureau of Agricultural Economics</i>	A. G. BLACK, <i>Chief</i> .
<i>Bureau of Agricultural Engineering</i>	S. H. MCCRORY, <i>Chief</i> .
<i>Bureau of Animal Industry</i>	JOHN R. MOHLER, <i>Chief</i> .
<i>Bureau of Biological Survey</i>	IRA N. GABRIELSON, <i>Chief</i> .
<i>Bureau of Chemistry and Soils</i>	HENRY G. KNIGHT, <i>Chief</i> .
<i>Commodity Exchange Administration</i>	J. W. T. DUVEL, <i>Chief</i> .
<i>Bureau of Dairy Industry</i>	O. E. REED, <i>Chief</i> .
<i>Bureau of Entomology and Plant Quarantine</i>	LEE A. STRONG, <i>Chief</i> .
<i>Office of Experiment Stations</i>	JAMES T. JARDINE, <i>Chief</i> .
<i>Farm Security Administration</i>	W. W. ALEXANDER, <i>Administrator</i> .
<i>Food and Drug Administration</i>	WALTER G. CAMPBELL, <i>Chief</i> .
<i>Forest Service</i>	FERDINAND A. SILCOX, <i>Chief</i> .
<i>Bureau of Home Economics</i>	LOUISE STANLEY, <i>Chief</i> .
<i>Library</i>	CLARIBEL R. BARNETT, <i>Librarian</i> .
<i>Bureau of Plant Industry</i>	E. C. AUCHTER, <i>Chief</i> .
<i>Bureau of Public Roads</i>	THOMAS H. MACDONALD, <i>Chief</i> .
<i>Soil Conservation Service</i>	H. H. BENNETT, <i>Chief</i> .
<i>Weather Bureau</i>	F. W. REICHELDERFER, <i>Chief</i> .

This circular is a contribution from

<i>Bureau of Biological Survey</i>	IRA N. GABRIELSON, <i>Chief</i> .
<i>Division of Wildlife Research</i>	W. B. BELL, <i>Principal Biologist Chief</i> .
<i>Section of Fur Resources</i>	FRANK G. ASHBROOK, <i>Principal Biologist in Charge</i> .